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APRIL-MAY-JUNE
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A. A. BROCK ..... Director
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PEACH YELLOW BUD MOSAIC

GILBERT L. STOUT, Chief, Bureau of Plant Pathology,
ARCHIE SCHLOCKER, Associate Plant Pathologist, and H. KEITH WAGNON,
Assistant Plant Pathologist, California Department of Agriculture *

Yellow bud mosaic is a destructive virus disease of peach trees which is capable of infecting almonds, apricots and certain other related hosts. It also is known as Winters' disease and Winters' peach mosaic because it was first seen in the vicinity of the town of Winters, California. Yellow bud mosaic causes a decline and death of infected peach trees but does little or no injury to almonds and apricots. Thomas and Rawlins (*1* †) reported almonds injured to an intermediate degree but infected infrequently. Trees of Elberta, Lovell and Muir peach have been observed to be seriously affected in the area where the disease was originally found. Two other varieties, designated by the growers as Sims in San Bernardino County and Levi (Henrietta) in Placer County, have been found affected, and current surveys may reveal additional varieties.

Yellow bud mosaic was discovered near Winters, California, about 1936. Surveys showed it to be present in the Winters area in both Yolo and Solano Counties and in some other parts of Solano County. In the spring of 1950 it was found in Southern California near Cucamonga in San Bernardino County by inspectors who were examining trees for peach mosaic disease. In April, 1952, its occurrence in another Northern California locality near the town of Loomis was brought to our attention by Agricultural Commissioner William H. Wilson of Placer County. These are the only localities where the disease is known to occur at the present time, and it is not known to exist outside of California.

Symptoms in peach consist of a yellow, irregular, blotchy mottle and distortion of leaves, an arresting or retarding of the development of stems and leaves from the buds, the development of rosettes of small, malformed leaves, and a dieback of twigs and branches. The limbs and larger branches become sunburned due to the lack of foliage, and the infected trees decline. Young trees are damaged more rapidly than older trees, and the disease varies in its rate of spread through individual trees. A Lovell peach tree in an advanced state of infection with yellow bud mosaic is shown in figure 1.

Leaf symptoms in peach are shown in figures 3 and 5. They include yellowish blotches of irregular shape, which often are elongated along the leaf veins, and which have diffuse and more or less feather-edged margins. Their appearance suggests a diffusion or leakage from the leaf veins into the adjacent tissues of something which causes the yellow blotching. The blotches commonly occur along the mid-vein and larger lateral veins, often toward the base of the leaf. These chlorotic areas frequently drop

* Acknowledgment is made of data supplied by B. W. Lee, Assistant Plant Pathologist in this bureau, who has made field studies of the disease in Southern California.
† See literature cited, p. 56

FIGURE 1. Orchard peach tree of Lovell variety in advanced stage of yellow bud mosaic infection. Note some normal appearing shoots, large amount of retarded growth, and bare branches.

FIGURE 2. Yellow bud mosaic affected branches. Right, showing retarded stem and leaf development from the buds ("yellow bud" phase), a few normal appearing leaves, and one fruit. Left, showing rosettes of dwarfed, distorted leaves expanded from the "yellow buds."

out. The chlorosis usually occurs predominantly on one side of the midvein and is accompanied by a leaf blade distortion which often takes the form of a pinching and lateral bending toward the chlorotic areas. Sometimes the yellow spots consist of small chlorotic flecks approximately one millimeter or more in diameter. In very mild cases and on trees which are in the very early stages of yellow bud mosaic, the only symptoms may be a few mottled leaves which may or may not be distorted. Painstaking and very thorough examination is necessary to detect the disease in such cases.

In advanced stages of the disease relatively few leaves may be present on the tree. (See figure 1). Many affected leaves are shed early in the season. Twigs with normal-appearing leaves and occasional fruits commonly may be seen on diseased branches. Such twigs contrast sharply with the more severely affected portions of the branches on which development of the buds into stems and leaves has been arrested or retarded. (See figures 1 and 2).

The phase of the disease which has prompted the use of the terms yellow bud and yellow bud mosaic (*1, 2*) is characterized by an arresting or a severe retarding of the development of stems and leaves from the leaf buds and a pale-yellowish color of the tiny young leaves. The latter sometimes die and turn brown before attaining a length of more than 2 to 5 millimeters, but they may grow slowly to a length of 5 to 10 millimeters and appear to remain in an arrested state of development. However, as the season progresses, many of these tiny, young, retarded, partially developed yellow leaves expand into small rosettes of dwarfed, distorted, yellowish-green leaves. (See figures 2, 4, and 6).

FIGURE 3. Four peach leaves showing typical chlorotic mottle and distortion and one twig tip showing "yellow bud" phase of the yellow bud mosaic disease. Photograph courtesy of H. Earl Thomas and T. E. Rawlins, University of California.

Twigs and branches on which there has been severe retarding or arresting of foliage development are likely to die, thereby contributing to the general decline of the tree.

No flower symptoms have been seen or are known. Observations indicate that on severely affected parts of the tree the flower buds commonly become detached and very few fruits, if any, are set or remain. Fruit production, therefore, is seriously reduced on severely affected trees.

Thomas and Rawlins (*1*) have reported, "Some dwarfing and malformation may occur on fruits of Muir peach but not on those of Elberta or Lovell."

In almond, according to the same authors (*1*), "In the spring the leaves are mottled (fig. 16, C) and the foliage is sparse. Later there are terminal tufts of leaves with little or no mottling." In an earlier publication (*3*) they stated, "Symptoms on Texas and seedling almond trees inoculated in the greenhouse with the Winters-peach-mosaic virus from peach or apricot vary from mild to severe, consisting in chlorotic spots on young leaves and tufting of older leaves which are often undulant and laterally curved as on some of the trees in the orchard. There is a tendency here also for arresting of the buds (fig. 9), which may die afterward or develop slowly into distinct rosettes."

There commonly occurs in almond leaves a mottling caused by the ring spot virus (*4*, figure 27, B) which closely resembles that referred to by the above authors (*3*, figure 8, B; *1*, figure 16, C) in connection with the yellow bud mosaic virus in almond.

In apricot, according to Thomas and Rawlins (*1*), "On the leaves there are occasional circular spots, usually about 10 millimeters across, with necrotic centers and chlorotic halos." Symptoms produced in seedling apricot leaves in the greenhouse have been illustrated by these authors (*3*, figure 8, A).

Thomas and Rawlins (*1*) reported natural infection on almond (*Prunus amygdalus*), apricot (*P. armeniaca*), and peach (*P. persica*), and they mentioned that old apricot trees apparently may be symptomless carriers.

Recently in a mixed planting of peach and plum trees where many peach trees were affected by the disease, the writers saw plum trees, designated by the owner as being of the Wickson variety, with symptoms suggesting infection with the yellow bud mosaic virus. Symptoms corresponding to both the leaf mottle and the arrested and retarded development of stems and leaves as seen in peach were observed in the plums. Transmission tests are in progress to determine whether the plums were infected with the yellow bud mosaic virus.

Thomas and Rawlins (*1*) have reported the following as to host range and varietal susceptibility:

"The peach varieties Babcock, Elberta, Fay Elberta, Florence, Lovell, J. H. Hale, Peak and Rio Oso Gem are about equally affected when artificially inoculated. Foster is somewhat less susceptible. Under natural conditions Elberta, Lovell, and Muir varieties are seriously injured. The causal virus has been transmitted by grafting to the following species: Almond, apricot, Portuguese laurelcherry (*P. lusitanica*), Japanese apricot (*P. mume*), rose (*Rosa* sp.) variety Ragged Robin, Japanese kerria (*Kerria japonica*), desert peach (*P. andersonii*) on peach roots, sweet

FIGURE 4. Part of young Elberta peach tree previously inoculated by budding from an infected orchard tree and showing rosettes of dwarfed, distorted, yellowish-green leaves.

FIGURE 5. Four peach leaves, from tree affected with yellow bud mosaic, showing chlorotic mottle and distortion.

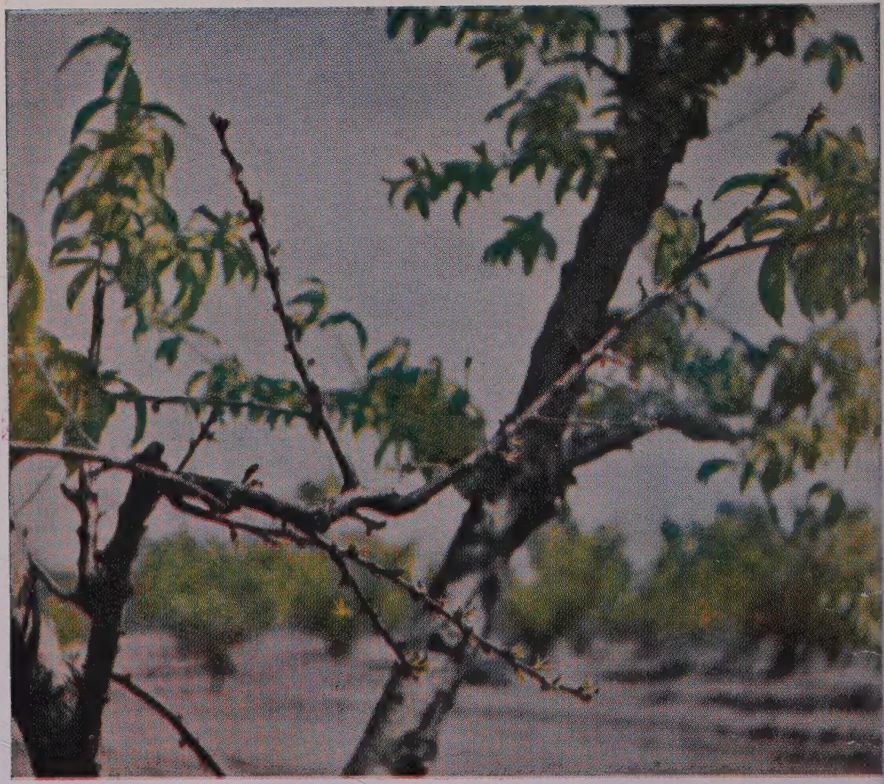

FIGURE 6. Part of a yellow bud mosaic affected orchard peach tree showing small rosettes of dwarfed, distorted, yellowish-green leaves on some branches in contrast with normal appearing leaves on others.

cherry (*P. avium*), and myrobalan plum (*P. cerasifera*)—the last by passage from peach through desert almond (*P. fasciculata*)."

Although the disease can be artificially transmitted by tissue union or grafting as with buds, scions, or inarches, the method of natural spread in the orchard is not known. One or more insect vectors are believed to be involved. Spread in the orchard appears to occur typically from infected trees to adjacent trees, but takes place over longer distances and from orchard to orchard. Frequently a focus of infection in an orchard occurs at or near the outside row and spread to adjacent trees affects areas in a more or less semicircular or half-moon shape with eventual enlargement of the area in irregular fashion.

In the light of our present knowledge control and suppression consists of repeated tree inspection early in the season and prompt removal of all trees which show any symptoms. Since symptoms are most clearly and distinctly expressed in the early spring, and become less distinctive and more difficult to distinguish from those caused by other conditions as the season progresses, the most efficient season for tree inspection begins as soon as there has been enough new growth in the spring for the earliest leaves to become expanded. At that time the so-called "yellow buds" or tiny, young, retarded, partially developed, yellow leaves stand out in contrast to normal appearing leaves; from then on for a period of a few weeks the typical, yellow, blotchy leaf mottle and accompanying leaf deformity in the expanded leaves can be seen. With the dropping of these leaves and the development of new normal appearing foliage, recognition of infected trees, particularly those in the very early stages of the disease, becomes increasingly difficult. Although severely affected trees continue to show damage in the form of dead or dying shoots and branches, inspectors soon are unable to distinguish yellow bud mosaic-affected trees from those which are affected by other causes. The best season for inspection is during the months of April and May with possible extension into June.

The virus can be carried in budwood, scions and nursery stock, and the disease thereby can be spread to new localities. Therefore, propagative material should not be taken from trees known or suspected to be infected or in areas where the disease occurs.

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QUICK DECLINE OF CITRUS

GILBERT L. STOUT, Chief, Bureau of Plant Pathology
and R. L. MCCLAIN, Associate Plant Pathologist
California Department of Agriculture

The highly destructive virus disease of citrus trees known as quick decline was so named because of the rapid deterioration of orange trees which are affected by it. Natural occurrence of the disease in California has been in trees with sweet orange top (*Citrus sinensis* Osbeck) and sour orange rootstock. (*Citrus aurantium* Linn.). The disease has also been produced experimentally in some other stock-scion combinations when inoculated by tissue union with buds and grafts from diseased trees. Some species and stock-scion combinations are capable of being symptomless carriers of the virus, for example, sweet orange trees on sweet orange rootstock.

Quick decline is a relatively new disease in California. It is very similar, and probably closely related, to the Tristeza disease of South America and like disorders in South Africa, Java, Australia, and possibly other parts of the world. These disorders and quick decline seem likely to be caused by virus forms or strains within a virus complex. A few orange trees now believed to have been affected by quick decline were observed in Southern California in 1939 and 1940. The nature of the malady was not then known. The disease appears to have become established at about the same time in three separate localities. These were the Azusa-Covina and the Rivera-Pico areas in Los Angeles County (San Gabriel Valley) and the Placentia area of Orange County. Since then it has spread more or less throughout the orange growing areas of Los Angeles, Orange, Riverside, and San Bernardino Counties and into parts of Ventura County. It has not been found in the Coachella Valley of Riverside County, and, although repeated surveys and tree-by-tree inspections are constantly being made of orange plantings throughout California, quick decline has not been found in any other part of the State. The rate of natural spread has been very fast in some localities and much slower in others. Some orchards have been destroyed by the disease within five years after the first affected trees were seen in them. Trees of all ages can become affected.

The symptoms of quick decline as observed in the orchard are, in general, the same as those produced by girdling or those resulting from root injury. Such symptoms also are found in trees affected by gopher injury, footrot or gummosis, oak root fungus, scaly bark, high concentrations of fertilizer, oil injury to the roots, or perhaps other factors.

Trees in very early stages of quick decline, when visible symptoms are first detectable by tree inspection, usually attract attention by their dull, grayish-green foliage which contrasts more or less sharply with the brighter green color of healthy trees. (See figure 1). On such trees there is a lack or suppression of the new flushes of growth, most noticeable

FIGURE 1. Quick decline affected orange tree in early stage. Note the dull, grayish-green foliage color.

FIGURE 2. Quick decline affected orange tree showing some older leaves remaining, especially at twig tips, and new shoots growing from the larger wood. Such trees usually live as chronic cases in a low state of vigor and productivity.

FIGURE 3. Orange tree in early stage of rapid collapse from quick decline. Note the dull, ashen or grayish-green, wilted and rolled leaves.

FIGURE 4. Later stage of quick decline in tree similar to that shown in figure 3. Leaves become dry and tan to brown. Many such trees die.

on the south side because there the flushes in healthy trees are likely to be more vigorous and abundant.

There is a tendency for quick decline affected trees to blossom heavily and to set an unusually heavy crop with many inside fruits in the early stages of attack. In navels, if the fruit is about to mature, high coloring develops more rapidly than in fruit on healthy trees.

Soon after the onset of leaf discoloration the older leaves begin to fall and the leaf fall tends to be progressive from the bases of the twigs to the tips. Many twigs become defoliated, or nearly so, with a few of the younger leaves remaining. There is some variation among affected trees as to the degree of defoliation. Some twigs die back from the tips, and, as the leaves drop, limbs become exposed. A considerable number of new shoots often are produced from the bare limbs and branches and the affected trees appear to make a partial recovery. (See figure 2). The amount of new growth and recovery varies, and although some affected trees die, most of them go into a chronic form of the disease and maintain themselves in a low state of vigor and productivity for an indefinite period of time. The latter condition has been referred to as an equilibrium stage.

Some trees collapse quickly, almost overnight, and before losing an appreciable amount of foliage. Their leaves become dull, ashen or grayish green, wilted and rolled inward toward the midrib on the upper surface. (See figure 3). Soon they become dry and tan to brown in color, and many of the suddenly collapsed trees retain their leaves for a considerable length of time. (See figure 4). Sometimes there is a heavy leaf fall, and, if this occurs while there is a heavy crop of highly colored fruit on the tree, the nearly leafless tree with its fruit presents a very striking appearance. Many of the suddenly collapsed trees die.

Trees showing the above top symptoms have more or less root injury which apparently begins in the small fibrous roots at the periphery of the root system. A decrease of starch occurs which can be demonstrated with an iodine test. It appears first in the small roots or rootlets and progresses back into the larger roots and finally into the sour orange part of the trunk up to the bud union. In the sour orange rootstock, the region in which the starch is depleted last is the central part of the woody cylinder just below the bud union.

The disappearance of starch apparently results from a girdling effect produced in the phloem tissue of the bark of the sour orange rootstock just below the bud union when the virus invades the sour orange stock from the sweet orange top. Microscopic examination shows a collapse of the sieve tubes in the phloem tissue in that region. Root starvation follows, as in a girdled tree. The fibrous roots die, then larger roots, with an accompanying sloughing of their bark.

Since other factors than the quick decline virus can cause the above symptoms, diagnosis is a progressive procedure, consisting of general inspection of the tree, elimination of other factors, root examination, starch test, rootstock identification, microscopic examination of phloem tissue from below the bud union, and finally, if necessary, a transmission test. The latter can be made by inoculation of young trees on sour orange rootstock, but an improved, more recent and more rapid procedure is to inoculate young seedlings of Mexican lime in the greenhouse. The limes have been found to show leaf symptoms of a vein clearing type of mottle

within approximately two months after inoculation with the virus. The infected limes also show a stem-pitting symptom. When young nursery trees of sweet orange on sour orange rootstock are inoculated out of doors as much as 12 to 18 months are required for symptoms to show.

The quick decline virus has been transmitted experimentally from tree to tree by the melon aphid (*Aphis gossypii* Glover), which apparently spreads the disease in nature. The virus also can be carried in budwood, scions and nursery stock, and the disease thereby can be spread to new localities. Quarantine measures are employed to prevent spread by such methods.

KNOW CALIFORNIA'S LAND

A new state publication entitled "Know California's Land," which should be of considerable use to farmers, stockmen, forest landowners, secondary schools, teachers in elementary schools, planning commissions, conservation organizations, and district, local, state and federal agencies dealing with soil and water conservation, has been published by the State Printing Plant.

The booklet contains 47 pages and includes facts about California land, descriptions of the eight land capability classes of the State, general types of conservation practices and uses recommended for these land capability classes, and physical descriptions of the State's eight major watersheds.

It is profusely illustrated with 76 photographs and drawings, and contains a 41- by 56-inch, eight-color map of California (in two sections) showing the general distribution of the land capability classes. The map is in a back cover folder and may be removed for use on a wall.

A foreword by Governor Earl Warren states in part:

"This publication contains valuable information concerning California's land—the nature, distribution, extent, use and conservation of this basic natural resource. It is intended to help bring about the most beneficial use of our land in these days when we must have the maximum return from all our available resources."

The authors of "Know California's Land" are Leonard R. Wohletz, Soil Scientist, United States Department of Agriculture, Soil Conservation Service, Berkeley, and Edward F. Dolder, Chief Conservation Education, State of California Department of Natural Resources, Sacramento. The book is available at $1 plus tax from the Division of Printing, Documents Section, 11th and O Streets, Sacramento.

VIRGATE STAR THISTLE, *CENTAUREA VIRGATA* VAR. *SQUARROSA* (WILLD.) BOISS. IN CALIFORNIA

By Margaret K. Bellue, Weed and Seed Botanist,
State Department of Agriculture

INTRODUCTION

In midsummer of 1950, we received from Loring White, Modoc County Agricultural Commissioner, a specimen of star thistle for determination. It was new to California and is noteworthy from an agricultural standpoint.

The original plants were collected from the roadside on the Kramer Ranch in Big Valley, immediately across the Lassen County line. The star thistle plants were observed for a distance of about 100 yards on both sides of the road, extending into a recently disced summer fallow field on one side and a stand of grain on the other.

Centaurea virgata var. *squarrosa* is a native of Eurasia, and collections from Asia and South Russia are included in the herbaria of the University of California and the California Academy of Sciences. The plants from Lassen County represent a first record for California.

The opinion of John Thomas Howell of the Academy of Sciences was sought in the identification of the new star thistle and his determination was subsequently verified in correspondence with Dr. S. F. Blake of the United States Department of Agriculture.

HISTORY IN LASSEN COUNTY*

Prior to about 1910 there is no data available concerning the ranch on which the major infestation of virgate star thistle now occurs. About 40 years ago the ranch was taken over by a merchant, allowed to lie idle and later rented out as sheep pasture. For many years the land was under lease to James Summers, a neighboring ranch owner. It was used as an overnight camp-ground by several sheep men when they trailed their bands from the Sacramento Valley to higher ranges in the summer and returned them in the fall.

Mr. Rupert Lyons, a local rancher, reports that about 15 to 18 years ago Mr. Summers commented on a weed which he said was taking over his leased pasture, stating that nothing would eat it. About seven or eight years ago Mr. Lyons purchased the property and on looking it over found a heavy infestation of "the weed." Mr. Lyons tried burning, with no success. He subsequently sold the land to Mr. O. E. Brown, whose son gathered the specimen which resulted in its identification in 1950 as *Centaurea virgata* var. *squarrosa.*

* Prepared by J. B. Phillips, formerly of Lassen County Department of Agriculture.

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During all these years the land had not been cultivated. Last year Mr. Brown had grain on part of the land and this year a new owner, Mr. James C. Grizzell, had grain in the same area. As far as can be noted, cultivation has not retarded the infestation. On the contrary, it appears thicker than on undisturbed land.

PRESENT KNOWN AREA OF INFESTATION

The largest known infestation of virgate star thistle covers an area about one mile wide by three miles long, running from the top of Big Valley Mountain down onto the valley floor and extending over ranches owned by James Pircen and James C. Grizzell, and into one corner of Ward Kramer's ranch.

Lately plants have been found on Highway 299 between Bieber and Nubieber and on the summit of Big Valley Mountain. There are numerous plants along the old abandoned state highway which runs from the top of Big Valley Mountain to Pittville. Mr. Collett, who lives on this road, reports that he first noticed the plant three or four years ago.

Plants are established along the county road between Pittville and the town of Fall River Mills on the south side of Fall River. Some sites are recorded from four miles inside the Shasta County line. Since stock is trailed along the old highway over Big Valley Mountain to Pittville, and from there on south of the river, there is a possibility of other infestations either above or below. Many of the large sheep outfits that formerly trailed through here had bases in Tehama County.

DESCRIPTION OF PLANT (Fig. 1)

Virgate star thistle is an herbaceous perennial, attaining a height up to three feet and branching divaricately above into numerous virgate branches.

Remnants of the old stems from previous seasons are often persistent about the enlarged somewhat woody crown. The heavy tap-type root extends to a considerable depth and is often few-branched.

The basal leaves are petioled and parted into linear lobes. The stem leaves are sessile and deeply many lobed. The lobes become fewer on the leaves of the upper parts of the plant; the uppermost are small and entire.

The few-flowered heads are borne on short stems, solitary or frequently in pairs.

The heads are slender urn-shaped, about one-half inch long including the corolla. The lobes of the corolla are exserted about one-fourth inch beyond the bracts. The terminal spines of the involucral bracts are conspicuously stouter than the five or six lateral spines and the terminal one is commonly somewhat spreading or recurved.

The corolla is pale to bright pink. Its slender lobes are about one-eighth inch long and the tube about one-fourth inch long. The achene is about one-eighth inch long, olive-drab to dull brown in color, longitudinally marked by several straw-colored lines. The persistent pappus consists of a series of scales or bristles varying in length from minute to about one-half the length of the achene.

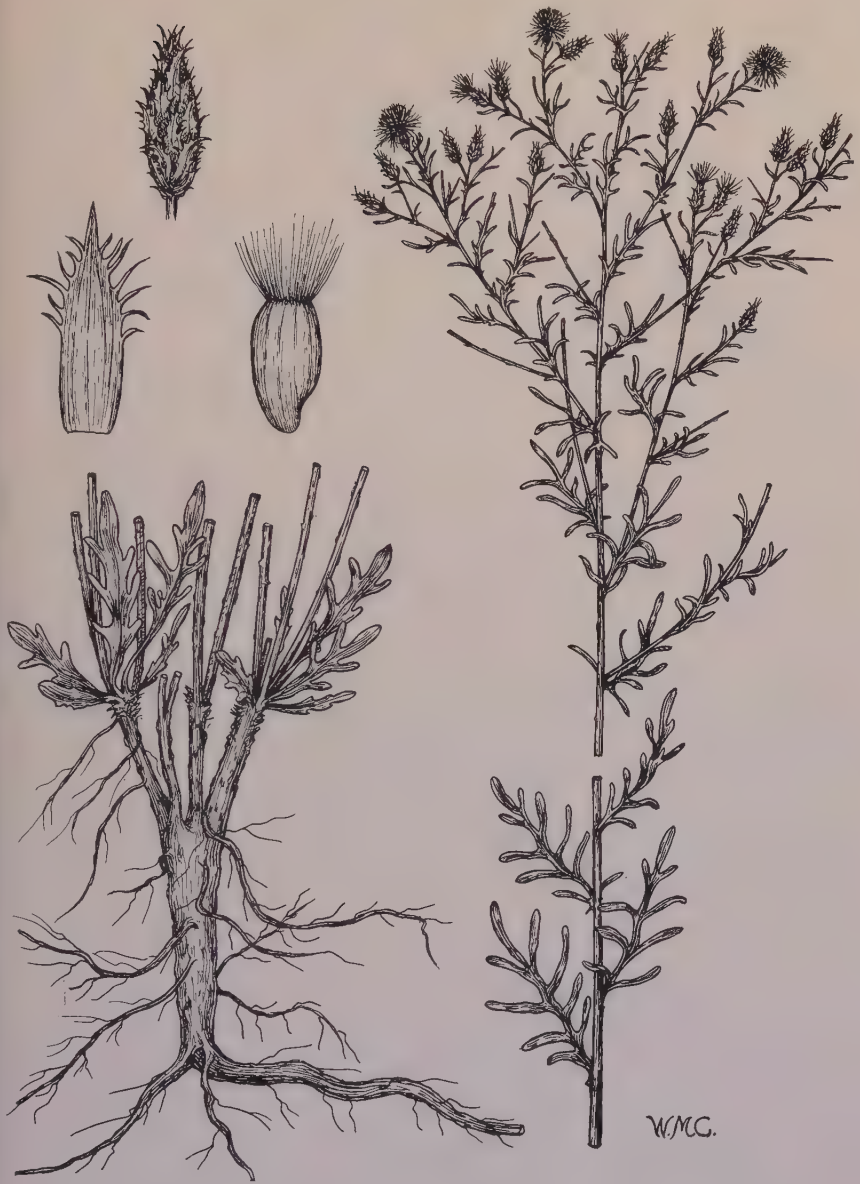


FIGURE 1. Virgate Star Thistle, *Centaurea virgate* var. *squarrosa*

DR. C. U. DUCKWORTH IN EUROPE WITH MUTUAL SECURITY ADMINISTRATION

At the request of the Mutual Security Agency of the United States Government, Dr. C. U. Duckworth, Assistant Director of the California Department of Agriculture, Sacramento, was granted a leave of absence to go to Europe as an agency advisor on livestock disease control problems to countries receiving financial and technical assistance and materials from the United States under the European Recovery Program. He left the United States for Europe in March, 1952. He will work with the Western European governments and Turkey, planning, organizing and reorganizing livestock disease control programs. In 1950 he made a trip to Europe to observe, advise, report and make recommendations on livestock disease and control programs.

Dr. Duckworth has had more than 25 years' experience in animal disease control, including several high level missions to Mexico and Central America.

Following graduation from Indiana Veterinary College, Indianapolis, in 1921 with the Degree of Doctor of Veterinary Medicine, his first major experience in animal disease control programs was participation with other state and national officials in control measures directed against two foot-and-mouth disease outbreaks in California. Both were curbed successfully, one after a large expenditure of public money to indemnify livestock owners, the other rather quickly through drastic quarantine and other sanitary control measures.

Dr. R. E. Duckworth, brother of Dr. C. U. Duckworth, will be Assistant State Director of Agriculture during the latter's absence from California. He has been in state service since 1917, acting in many capacities requiring the training and experience of a veterinarian.

Dr. R. E. Duckworth received his Degree of Doctor of Veterinary Medicine from San Francisco Veterinary College in 1915. He voluntarily retired from the state service on January 1st of this year, only to be recalled by Director Brock to assume the noncivil service post of assistant director.

ERIOPHYID STUDIES XIX

H. H. Keifer
California Department of Agriculture

The genus *Aceria*, which is the largest of the Eriophyid genera, continues to grow. This nineteenth installment describes six new *Aceria* species, four of which are Californian. The new species are: one on carnation in Southern California; a second *Aceria* which causes longitudinal folds in barberry leaves; the third is from Chile and has the unusual habit of producing bead galls on twigs of Acacia; the fourth *Aceria* damages greenhouse *Tradescantia* in Maryland; the fifth is a spiny mite on *Eriodictyon*; the sixth *Aceria* lives in the flower heads of iodine bush and salicornia. The other two described mites are: a *Paraphytoptus* on pine tree mistletoe; a species of *Tetra* on mountain mahogany.

The previous installment of Eriophyid Studies, XVIII, appeared in the Bulletin under date of March 18, 1952: Vol. 41, No. 1, p. 31.

Aceria paradianthi Keifer, new species

Plate 211

Female 200μ long, 50-55μ thick, wormlike; color yellow. Rostrum 36μ long, downcurved. Shield 35μ long, 43μ wide; design a network: Median line starting from a fork from the admedians at $\frac{1}{3}$, at $\frac{2}{3}$ a transverse line runs across the shield from in front of dorsal tubercles on each side, two curved lines connect median line to admedians just ahead of rear margin; admedians curved, close together on front $\frac{1}{3}$ ahead of median line; first submedian line extending to a point laterad of each dorsal tubercle where it connects by a cross line to the transverse line; second submedian line broken; shield with a well defined longitudinal granular area above the coxae; dorsal tubercles 25μ apart; dorsal setae 25μ long, projecting backward. Forelegs 38μ long, tibia 9μ long, tarsus 10μ long, claw 9μ long, curved, tapering; featherclaw 6-rayed. Hindlegs 35μ long, tibia 6μ long, tarsus 8μ long, claw 9μ long. Coxae somewhat granular, the first coxae hardly connate centrally. Abdomen with about 85 rings; the microtubercles equally developed dorsally and ventrally and each produced into a point. Lateral seta 45μ long, on about ring 10; first ventral seta 55μ long, on about ring 29; second ventral 45μ long, on about ring 50; third ventral 43μ long, on ring 8 from rear; accessory seta present. Female genitalia 28μ wide, 17μ long, coverflap with about 14 longitudinal furrows; seta 25μ long.

Male not seen.

Type locality: Goleta, California. **Collected**: February 25, 1952, by R. J. Reid, Santa Barbara County Agricultural Inspector. **Host**: *Dianthus* sp., Carnation (Caryophyllaceae). **Relation to host**: The mites live between the leaf bases and stems, being especially numerous toward the lower sections of the plant. The result is a tendency toward stunting and basal sprouting. Infested plants are said to have a water-soaked appearance, but the writer has not seen damaged plants. Clippings would indicate a certain amount of yellowing results from the mites' activities. **Type material**: One designated type slide, and eight paratype slides; also the dry envelope material. *Aceria paradianthi* is characterized by the 6-rayed featherclaw and the transverse line across the shield at the $\frac{2}{3}$ point. A species, *dianthi* Lindroth 1904, evidently referable to *Aceria*, is said to be free living on carnation in Europe, and to have a 5-rayed featherclaw. See Roivainen, Animalia Fennica #6, p. 94, 1951.

Aceria caliberberis Keifer, new species

Plate 212

Female 170-195μ long, 40-45μ thick; color light yellow; body shape wormlike. Rostrum 28μ long, curved down. Shield 30μ long, 34μ wide; central design mostly obsolete, the admedian lines distinct on the rear half; shield laterally with two diverging longitudinal lines which suddenly converge to rear of shield, and have two diagonal connecting lines; lateral granules nearly absent; dorsal tubercles 21μ apart; dorsal setae projecting backwards 30μ. Forelegs 33μ long, tibia 7μ long, with seta; tarsus 7.5μ long, claw 10μ long, tapering; featherclaw 5-rayed. Hindlegs 30μ long, tibia 5μ long, tarsus 7μ long, claw 10μ long. Abdomen with 50-55 rings, evenly set with microtubercles; the microtubercles rounded. Lateral seta 40μ long, on about ring 6 behind shield; first ventral seta 60μ long, on about ring 15; second ventral 14μ long, on about ring 28; third ventral seta 35μ long, on about ring 6 from rear; accessory seta present. Female genitalia 21μ wide, 16μ long, coverflap with about 12 longitudinal furrows; seta 45μ long.
Male not seen.

Type locality: Garnet Peak, San Diego County, California. **Collected:** November 22, 1951, by Professor C. E. Norland, San Diego State College. **Host:** *Berberis californica* Jepson, Barberry (Berberidaceae). **Relation to host:** The mites make an irregular, sinuate fold in the leaves from the upper surface. This fold usually is longitudinal, but may occur on any part of the leaf from midrib to edge. **Type material:** A type slide and eight designated paratype slides: also the dry material from which the slides were made. The distinctive feature of this mite is the lateral design on the shield.

Aceria rosas-costae Keifer, new species

Plate 213

Female 115-125μ long, 30μ thick, short, wormlike, red color. Rostrum 19μ long, downcurved. Shield 22μ long, 25μ wide; design faint, the admedians distinct on the rear $\frac{2}{3}$ of the shield; laterally the shield has a few large granules above the coxae. Dorsal tubercles 18μ apart; dorsal setae projecting backwards 14μ. Forelegs 23μ long, tibia 5μ long, with a seta; tarsus 6μ long, claw 6μ long, tapering; featherclaw 5-rayed. Hindlegs 22μ long, tibia 4.5μ long, tarsus 5.5μ long, claw 6.5μ long. Coxae connate. Abdomen with 40-45 rings, evenly set with microtubercles, the microtubercles rounded. Lateral seta 17μ long, on about ring 7; first ventral seta 50μ long, on about ring 15; second ventral 8.5μ long, on about ring 22; third ventral 19μ long, on about ring 5 from rear; accessory seta present. Female genitalia 16μ wide, 8μ long, coverflap with 6 or 7 diagonal furrows; seta 15μ long.
Male not seen.

Type locality: Cachagua, La Lajuela, Chile. **Collected:** October 7, 1944 by T. Schudeck. **Host:** *Acacia cavenia* Mol., Leguminosae. **Relation to host:** The mites produce bead galls, with central openings, on the twigs. When the galls form, the twigs are presumable green. **Type material:** Type slide and twelve paratype slides; also the dry plant parts bearing the galls. Five of these paratype slides are being sent to Dr. J. A. Rosas Costa, Buenos Aires, who sent me the material, and for whom I am naming the species. The mite itself is rather nondescript, but the formation of bead galls on twigs is most unusual as far as our present acquaintance with Eriophyids goes.

Aceria tradescantiae Keifer, new species

Plate 214

Female 200μ long, 50-55μ thick, wormlike, color light yellow. Rostrum 22μ long, downcurved. Shield 38μ long, 36μ wide; median line distinct on rear half of shield; admedian lines gradually diverging toward rear; first submedian line forked twice in front of dorsal tubercles, with short dashes scattered between these lines; lateral granular band with a distinct line running along upper edge; dorsal tubercles 21μ apart; dorsal setae 48μ long, projecting backwards. Forelegs 37μ long, tibia 8μ long, with seta; tarsus 8μ long, claw 9μ long, tapering; featherclaw 8-rayed. Hindlegs 35μ long, tibia 7μ long, tarsus 8μ long, claw 10μ long. Coxae with granules and short dashes, the forecoxae connate. Abdomen with about 75 rings; microtubercles evenly spaced throughout and

rounded. Lateral seta 48μ long, on about ring 10; first ventral seta 55μ long, on about ring 26; second ventral 50μ long, on about ring 45; third ventral 28μ long, on about ring 5 from rear; accessory seta present. Female genitalia 21μ wide, 11μ long, coverflap with about fourteen longitudinal furrows; seta 18μ long.

Male not seen.

Type locality: College Park, Maryland. **Collected**: Mar. 17, 1952 by Professor H. S. McConnel of the University of Maryland. **Host**: *Tradescantia* spp., Wandering Jew (Commelinaceae). **Relation to host**: The mites presumably live at the leaf bases and cause stunting and drying of the plants. (Exact information on this point is not available at this writing.) **Type material**: Type slide and seven designated paratypes; also the dry material of the *Tradescantia* from which the slides were made. This mite came to the writer originally under U. S. Bureau of Entomology #52-2053. The mites attracted attention by damaging their host in a University of Maryland greenhouse. *Aceria tradescantiae* is close to *Aceria tulipae* (K.), but differs in having an 8-rayed featherclaw and has more short dashes on the shield.

Aceria eriodictyonis Keifer, new species

Plate 215

Female 170-180μ long, 45μ thick, wormlike, yellowish. Rostrum 25μ long, directed downwards. Shield 24μ long, 33μ wide; design of longitudinal lines: median line present toward rear; admedians near each other anteriorly, curving outward in center; first submedian lines forked in front of tubercles; second and third submedians present; few lateral microtubercles. Dorsal tubercles 17μ apart on rear margin; dorsal setae 19μ long, projecting backward. Forelegs 25μ long, tibia 5μ long, with strong seta: tarsus 7μ long, claw 10μ long, slightly knobbed; featherclaw 4-rayed. Hindlegs 23μ long, tibia 4μ long, tarsus 5μ long, claw 10μ long. Abdomen with about 50 rings; completely microtuberculate, the microtubercles produced into moderately long spinules. Lateral seta 10μ long, on about ring 7; first ventral seta 12μ long, on ring 17; second ventral 7μ long, on ring 29; third ventral seta 11μ long, on about ring 6 from rear. Female genitalia 22μ wide, 16μ long, coverflap with about 8 longitudinal furrows; seta 8μ long.

Male not seen.

Type locality: Castaic, Los Angeles Co., Cal. **Collected**: Oct. 4, 1951, by L. E. Myers, of the Los Angeles Agricultural Commissioner's Office, and by the writer. **Host**: *Eriodictyon crassifolium* Benth., (Hydrophyllaceae). **Relation to host**: The mites occur on the thick sticky hairs on the small leaves immediately after they have emerged from the terminal bud. **Type material**: One type slide and fourteen paratype slides bear the above data. This mite has the longest microtubercle spinules of any Eriophyid yet discovered in California. These spinules, and those on other Eriophyids previously described, are apparently correlated with the sticky nature of the hosts, preventing the mites from becoming fatally trapped.

Aceria allenrolfeae Keifer, new species

Plate 216

Female 160μ long, 45μ thick, wormlike, dull yellow-white. Rostrum 23μ long, curved down. Shield 23μ long, 28μ wide; the central design obsolete; laterally with an ocellar spot just ahead of the rings, with a line above it. Dorsal tubercles 24μ apart, dorsal setae 28μ long, projecting backward. Forelegs 30μ long, tibia 6μ long, with seta; tarsus 8μ long, claw 9μ long, tapering; featherclaw 6-rayed. Hindlegs 27μ long, tibia 5μ long, tarsus 8μ long, claw 10μ long. Forecoxae contiguous, with no apparent granulations. Abdomen with 50-55 rings, some ventrad reduction in ring number; the rings set with rather large, rounded microtubercles. Lateral seta 22μ long, on about ring 7; first ventral 45μ long, on about ring 16; second ventral seta 20μ long, on about ring 27; third ventral seta 29μ long, on ring 5 from rear. Accessory seta present. Female genitalia 20μ wide, 15μ long, coverflap with about 8 longitudinal ridges; seta 32μ long.

Male not seen.

Type locality: Seventeen miles south of Bakersfield on highway just north of Wheeler Ridge. **Collected**: Nov. 18, 1951 by the writer. **Host**: *Allenrolfea occidentalis* (Wats.), Iodine bush (Chenopodiaceae). **Relation to host**: The mites live at the junction of the joints, and especially in the flower heads. The host is probably little damaged. **Type material**: A type slide and six paratype slides so designated. In addition there is a considerable amount of dry plant material from which the slides were made. What appears to be this same mite also occurs in *Salicornia* along the San Diego County coast. *Aceria salicorniae* (Nal.), described from Cyprus, is said to have a shield design of longitudinal lines and a 5-rayed featherclaw. *Aceria allenrolfeae* has unusually long genital setae.

Paraphytoptus arceuthobii Keifer, new species

Plate 217

Female 160-170μ long, 40-45μ thick, stocky, yellowish. Rostrum 33μ long, curved down. Shield 31μ long, 43μ wide; design a network: median line complete, receiving a dart-shaped mark at $\frac{1}{3}$ and joining two convex lines at rear; submedian lines undulating, meeting the admedians in the middle, and the outer ends of the convex lines to the rear; second submedians curved and broadly forked in front of dorsal tubercle; large lateral granular area. Dorsal tubercles 26μ apart, the setae projecting 20μ backward. Forelegs 33μ long, tibia 7μ long, with strong seta; tarsus 8μ long; claw 7μ long, tapering; featherclaw 6-rayed. Hindleg 29μ long, tibia 6μ long, tarsus 7μ long, claw 9μ long. Coxae narrowly connate centrally, granular. Abdominal rings completely microtuberculate, the rear quarter of the abdomen with tergites differentiated from the sternites by being broader, with elongate microtubercles, and covering about two sternites each; 65-68 sternites, 55-60 tergites. Lateral seta 25μ long, on about ring 11; first ventral 38μ long, on ring 23; second ventral 8μ long, on ring 38; third ventral 26μ long, on ring 5 from rear. Accessory seta present. Female genitalia 15μ long, 25μ wide, coverflap with about 12 longitudinal furrows; seta 16μ long.

Male not studied.

Type locality: Fallen Leaf Lake, El Dorado County, Cal. **Collected**: Sept. 13, 1951 by the writer. **Host**: *Arceuthobium campylopodium* Engelm., Pine tree mistletoe (Loranthaceae), growing on Jeffreyi pine. **Relation to host**: The mites live in the pockets holding the staminate flowers; no damage was apparent. **Type slide**: So designated, with the above data. **Partype slides**: Nine in number. There is also dry plant material from which part of the slides were made. The 6-rayed featherclaw is partly distinctive for this mite. This is the first species of *Paraphytoptus* discovered in California that lives on a non-hairy host. In this case the mite functions entirely as a budmite, unlike the other members of the genus which are in part free-living. The species probably has a wide range in California on pine tree mistletoe, as illustrated by an additional record: Mt. Diablo, Contra Costa County, Cal., Sept. 20, 1951.

Tetra cercocarpi Keifer, new species

Plate 218

Female 140μ long, 45μ wide, 40μ thick, short-spindleform, yellowish. Rostrum 30μ long, projecting down. Shield 48μ long, 43μ wide, with a moderately large lobe over rostrum; shield without an apparent design but with some slight granulations; dorsal tubercles 25μ apart, on rear margin; dorsal setae 22μ long, projecting up and backward. Legs with femoral setae present; foreleg 35μ long, tibia 7μ long, tarsus 7μ long, claw 8μ long, tapering; slightly knobbed; featherclaw 6-rayed. Hindleg 28μ long, tibia 6μ long, tarsus 6μ long, claw 9μ long. Anterior coxae contiguous. Abdomen with 27 tergites and 45 sternites; the tergites without microtubercles except on lateral lobes; the first two tergites produced upward to form a transverse ridge, with the remainder forming a broad central longitudinal trough flanked on each side by longitudinal ridge; sternites with pointed microtubercles. Lateral seta 10μ long, on about sternite 6; first ventral 32μ long, on about sternite 16; second ventral 11μ long, on about sternite 27; third ventral 16μ long, on sternite 5 from rear. Accessory seta present. Female genitalia 21μ wide, 17μ long, coverflap with 10-12 double-ranked longitudinal ridges; seta 17μ long.

Male about the same size as the female.

Type locality: Rocky Camp, Hat Creek, Shasta County, Cal. **Collected:** Aug. 10, 1948, by the writer. **Host:** *Cercocarpus ledifolius* Nutt. (Rosaceae), Mountain mahogany. **Relation to host:** The mites are vagrants on the leaves in the undersurface pubescense. **Type slides:** A type slide and six paratype slides have been designated with the above data. In addition there is the dry material from which the slides were made. The type of this genus, *concava* (K.), on elm, has much longer dorsal setae, the shield has a definite pattern and the transverse tergal ridge is on the third tergite. A third species in this genus, *Tetra rhamni* Roivainen occurs on *Rhamnus cathartica* L. in Finland.

RESORCINOL IN MITE MOUNTING MEDIA

Resorcinol (meta-dihydroxy benzene; 1,3, benzenediol) has certain characteristics that make it advantageous in the preparation of Eriophyid mites for study under the microscope.

Resorcinol belongs to the phenol type of chemicals, and its two nearest chemical "relatives" are hydroquinone and pyrocatechol. Neither of these latter chemicals have proven to be useful in the procedures herein described. Resorcinol is quite water soluble and, like phenol, it has a strong clearing and expanding action on Eriophyids. Its ability to clear all opaque material from the inside of Eriophyids becomes stronger than phenol as the result of aging, in some types of media. Mites left in such a medium will be destroyed much faster than those in chloral hydrate media without resorcinol.

A first step formula, incorporating resorcinol, with gum arabic as the thickener, and iodine as the stain, is as follows:

1. Gum arabic powder	1.0	gram
2. Resorcinol crystals	3.0	grams
3. Potassium iodide crystals	0.2	gram
4. Iodine crystals	0.2 to 0.35	gram
Grind in mortar, transfer powder to screw-cap vial		
5. Lactic acid, commercial solution	10.0	cc
6. Hydrochloric acid	8	drops

Heat this mixture in a 45° C. oven for 4 to 5 hours, or until the gum arabic is dissolved. Do not add glycerin as it forms a separate phase with the resorcinol. Do not add water as it destroys the isotonicity of the solution and the mites tend to shrivel.

The next step is that of putting the mites in this medium and the application of heat. This heat should be only enough to barely bring the solution to a boil, or even a little short of that. If plant material containing dry mites is simmered in this solution in a casserole, pour out the medium onto glass slides and recover the mites under the microscope with transmitted light.

Next we take advantage of the fact that resorcinol forms an insoluble polymer with formaldehyde at room temperature. This reaction is aided by the hydrochloric acid.

The following intermediate mixture is necessary in order to remove excess resorcinol, which would "foul up" the final mount.

1. Table sugar (sucrose)	1.	gram
2. Chloral hydrate crystals	8.	grams
3. Potassium iodide	0.2	gram
4. Iodine crystals	0.35	gram
Grind in mortar, transfer to screw-cap vial		
5. Formaldehyde, $\frac{1}{3}$ original strength	30 drops ($\frac{3}{4}$ cc)	

Screw cap down tight to prevent escape of the HCHO and warm for 24 hours in a 45° C. oven.

When needling mites over into this intermediate medium be careful not to let the amount of resorcinol rise to the point where it will jell, as the mites are not readily removed from the jell. The mites can be left in this mixture for an indefinite period. After a day or two they are firm enough to be transferred to balsam or into casting plastic, if the operator wishes to go to that much trouble. They can be put directly into a casting plastic such as Selectron. To put the mites into balsam requires passage through alcohol and xylene, which is considerably more difficult.

The following permanent medium is designed to receive the mites when the excess resorcinol is gone. Usually an interval is advantageous before this transfer, but the worker can determine that by experience. In many cases immediate transfer will be successful, and no shriveling result.

1. Gum arabic powder	0.5	gram
2. Table sugar, sucrose	0.5	gram
3. Chloral hydrate crystals	7.0	grams
4. Potassium iodide crystals	0.2	gram
5. Iodine crystals	0.2 to 0.35	gram
Grind in mortar, transfer to screw-cap vial		
6. Formaldehyde, ¾ original strength	18	drops

It may be more advantageous to add 2 grams of chloral hydrate at first, then warm the mixture in a 45° C. oven until dissolved, and then add the remaining 5 grams of chloral hydrate. Gum arabic dissolves reluctantly in concentrations of chloral hydrate as shown in the above formula.

Mites placed in this medium can be oriented for a while, until the formaldehyde has hardened both them and the resorcinol. When hardened, further turning of them is either difficult or impossible.

All of the type slides, and one or two paratype slides each, of the species herein described have been sent to Dr. C. F. W. Muesebeck, for the mite collection of the U. S. Bureau of Entomology, Washington, D. C.

DESIGNATIONS ON THE PLATES

AP1—Internal female genital structures
DA—Dorsal view of shield
ES—Side skin structure
F—Featherclaw
GF1—Female genitalia and coxae from below
S—Side view of mite
SA—Side view of anterior section of mite

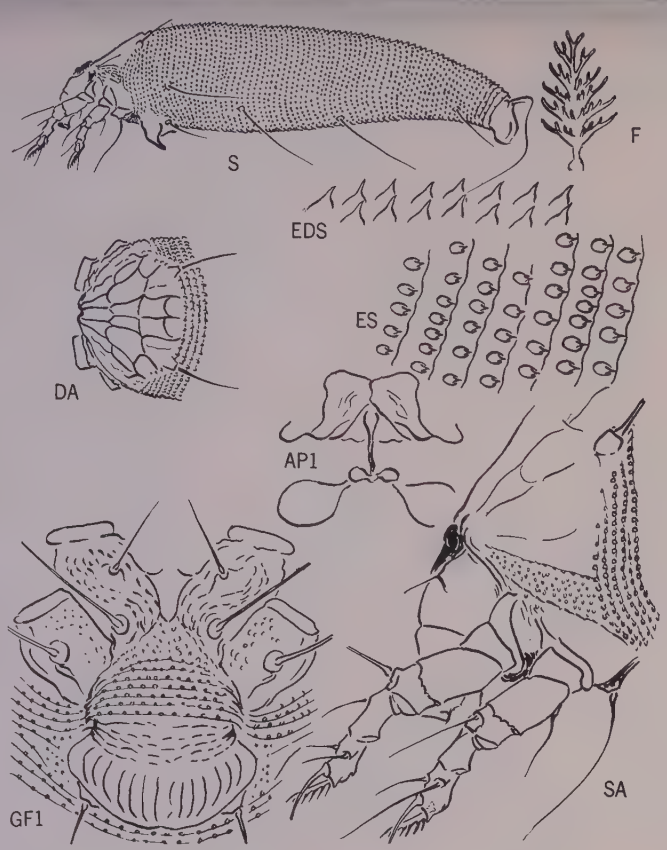


PLATE 211. *Aceria paradianthi* K., new species

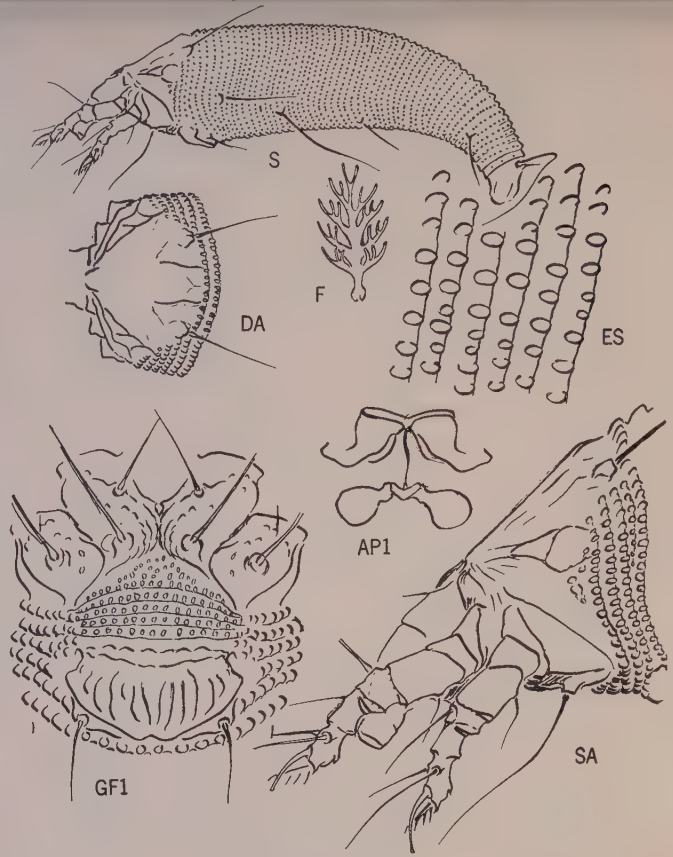


PLATE 212. *Aceria caliberberis* K., new species

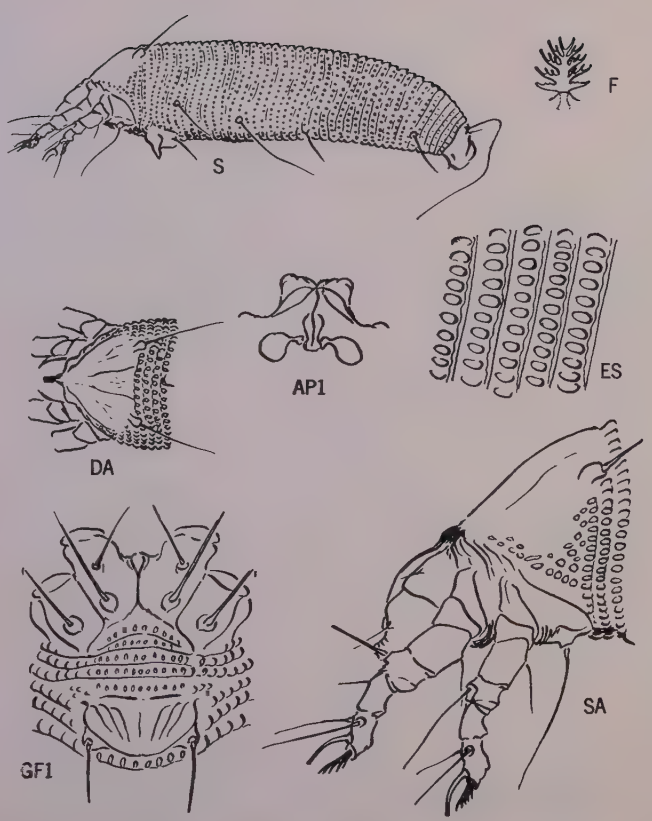


PLATE 213. *Aceria rosas-costae* K., new species

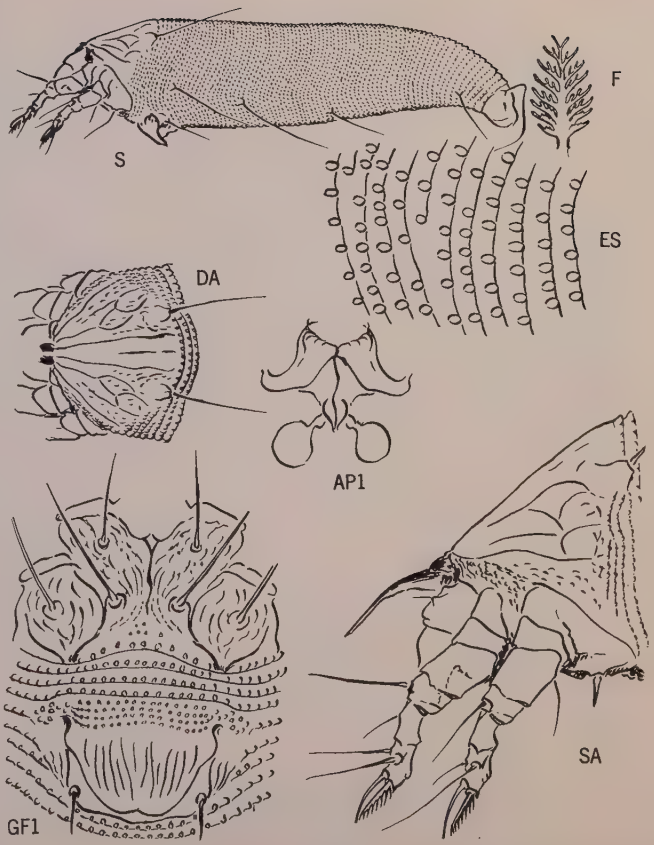


PLATE 214. *Aceria tradescantiae* K., new species

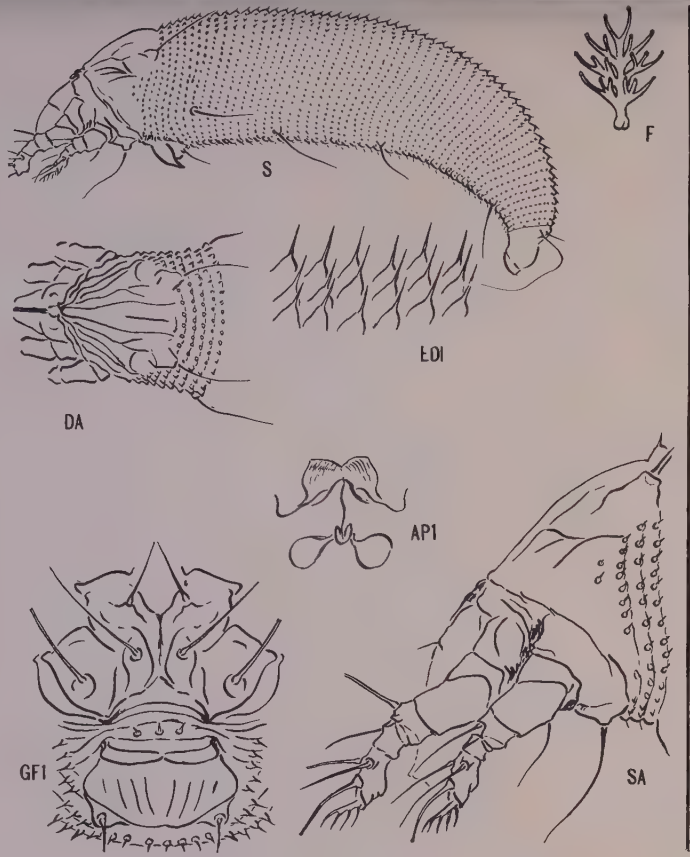


PLATE 215. *Aceria eriodictyonis* K., new species

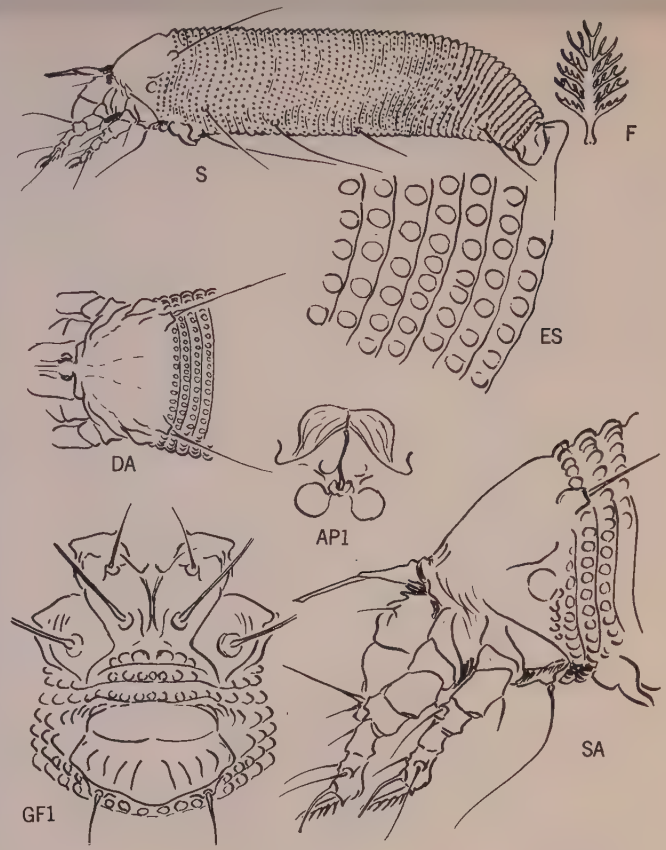


PLATE 216. *Aceria allenrolfeae* K., new species

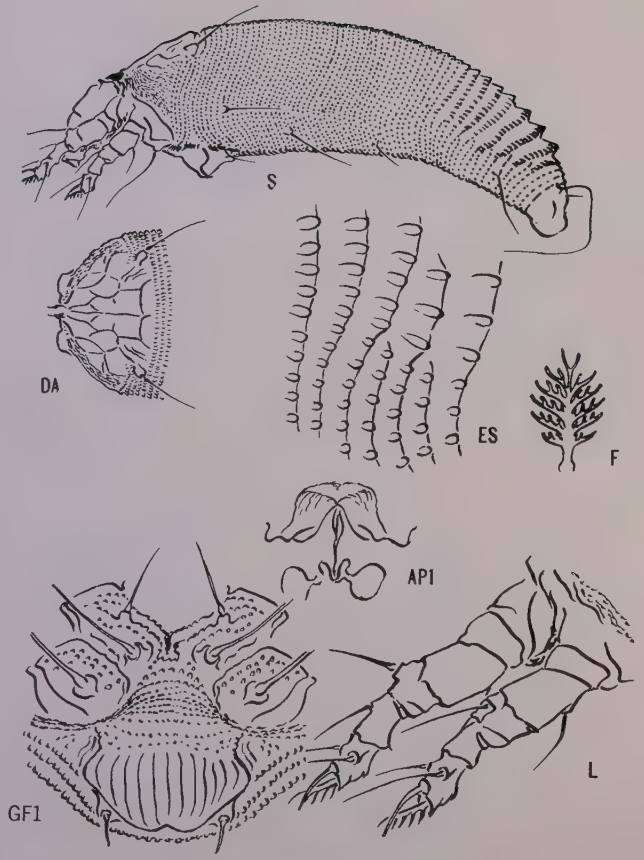


PLATE 217. *Paraphytoptus arceuthobii* K., new species

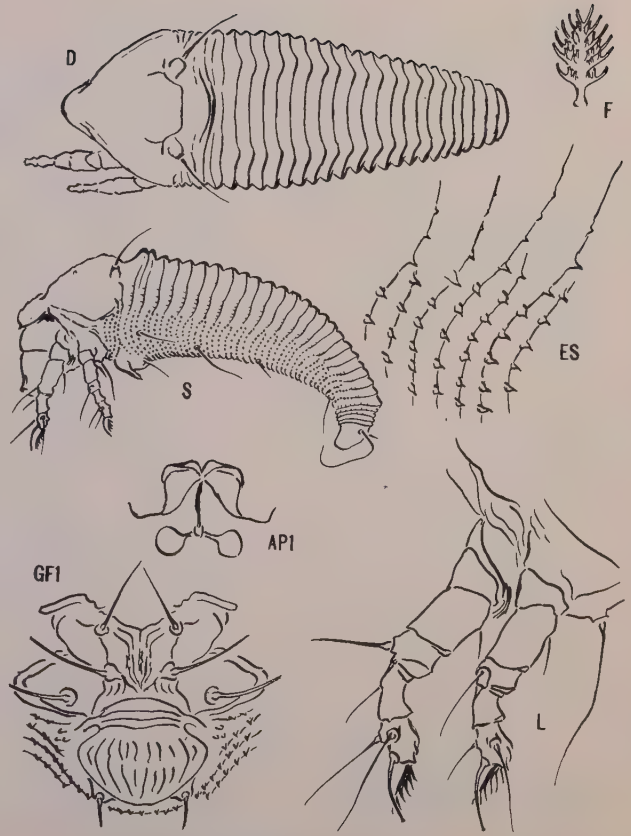


PLATE 218. *Tetra cercocarpi* K., new species

CALIFORNIA FRUIT AND NUT CROP ACREAGE ESTIMATES AS OF 1951

By R. E. Blair, Harry Friesen, and N. P. Byrd

The areas devoted to the culture of fruit and nut crops in California account for a major segment of the agriculture of the State and likewise produce a dominant portion of such crops in the United States. This summary as of 1951 is another in a rather long series of annual acreage estimates of these crops as grown in California. A series of county tables are presented which record acreages for each crop as bearing and nonbearing.

The combined plantings of tree fruits, nuts, and grapes standing in California in 1951 totaled 1,485,708 acres as compared with 1,491,223 acres in 1950. This is a reduction of about one-third of 1 percent. Among these extensive acreages there are always some shifts from one season to the next and an over-all change of this amount is of little significance. However, the changes indicated for individual crops are of more importance. The 1951 acreage consisted of 1,351,826 classed as bearing and 133,882 as nonbearing.

Included in the nonbearing total are 20,520 acres planted in 1951. This compares with 24,036 acres now standing that were planted in 1950 and 23,632 acres now standing that were planted in 1949. The most extensive plantings in 1951 consisted of 4,227 acres of almonds, 3,982 of Freestone peaches, 2,894 of Raisin variety grapes, 1,600 of Clingstone peaches, 1,362 of walnuts, 1,060 of Table variety grapes, and 1,017 acres of Wine variety grapes. Among the 1951 plantings of the other crops in this list, none exceeded 1,000 acres.

This report summarizes the most recent tabulations of county data as relating to acreages standing in 1951. Fruit and nut crop acreage estimates have been provided annually through a cooperative undertaking between the respective county agricultural commissioners and the California Crop and Livestock Reporting Service,[1] partially from new enumerations and partly by recording changes from the previous year. Beginning in 1948 and continuing through the following three years, complete enumerations of commercial acreages have been made in many counties with the use of funds available through Research and Marketing Administration projects. In accomplishing this, federal funds were matched by the State and some of the counties.

These records are on about the same basis as similar reports for the past two years. However, estimates for 1949, 1950, and 1951 may not be wholly comparable with those of earlier recent years, on account of the results of new and more exact surveys that have been completed since 1948 in various important fruit and nut producing counties. There

[1] The California Crop and Livestock Reporting Service is conducted jointly by the Bureau of Agricultural Economics of the United States Department of Agriculture and California Department of Agriculture.

are 25 separate tree and vine crops included, which are further segregated into 164 individual varieties or varietal groups.

The major changes from a previous year include: Acreages removed or abandoned, new plantings made, and the shifting from a nonbearing position to bearing. Bearing and nonbearing acreage segregations as used in this report have been arbitrarily established on a basis of age. There is, of course, no exact first bearing age that would apply to all trees of a variety of any of these crops in a county, but a careful effort has been made to adopt the most probable average period required for a new planting to come to production in each county.

The second series of tables in this report record acreage data as standing in 1951, relating to the principal varieties of each crop and by date of planting. These data are on the basis of state totals.

STATE TOTALS CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES AS OF 1951

	Bearing	Nonbearing	Total	New plantings 1951[1]
Almonds	90,874	23,699	114,573	4,227
Apples—Gravenstein	7,657	84	7,741	9
Apples—Others	18,387	3,407	21,794	148
Apples—All	26,044	3,491	29,535	157
Apricots	44,065	1,423	45,488	101
Avocados	12,827	6,830	19,657	688
Cherries—Royal Ann	3,036	734	3,770	73
Cherries—Others	6,336	1,153	7,489	46
Cherries—All	9,372	1,887	11,259	119
Chestnuts	267	17	284	----
Dates	4,328	832	5,160	32
Figs—Kadota	5,325	41	5,366	----
Figs—Others	21,367	1,884	23,251	8
Figs—All	26,692	1,925	28,617	8
Filberts	35	4	39	----
Grapes—Raisin varieties	230,379	8,246	238,625	2,894
Grapes—Table varieties	91,609	3,930	95,539	1,060
Grapes—Wine varieties	158,639	3,378	162,017	1,017
Grapes—All	480,627	15,554	496,181	4,971
Grapefruit	9,459	347	9,806	86
Lemons	54,309	7,144	61,453	651
Limes	344	1	345	----
Nectarines	2,130	1,006	3,136	436
Olives	27,433	3,731	31,164	230
Oranges—Navel and miscellaneous	77,863	1,838	79,701	149
Oranges—Valencia	130,546	6,459	137,005	105
Oranges—All	208,409	8,297	216,706	254
Peaches—Clingstone	46,025	9,499	55,524	1,600
Peaches—Freestone	32,734	8,165	40,899	3,982
Peaches—All	78,759	17,664	96,423	5,582
Pears—Bartlett	34,516	3,084	37,600	442
Pears—Others	5,042	333	5,375	22
Pears—All	39,558	3,417	42,975	464
Pecans	594	95	689	2
Persimmons	636	50	686	----
Plums	23,270	2,796	26,066	596
Pomegranates	402	37	439	34
Prunes	99,343	7,867	107,210	520
Quinces	185	----	185	----
Walnuts	111,864	25,768	137,632	1,362
Totals	1,351,826	133,882	1,485,708	20,520

[1] 1951 plantings included in 1951 nonbearing acreage.

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES AS OF 1951—STATE AND COUNTY SUMMARY
TOTAL ACRES BY CROP GROUPS

County	Principal deciduous tree fruits[1]	Citrus[2]	Other tree fruits[3]	Nuts[4]	All grapes[5]	Total
Del Norte	16					16
Humboldt	233		1	106	3	343
Mendocino	4,003	2	8	641	6,722	11,376
Shasta	241		838	86	30	1,195
Siskiyou	71			5	2	78
Trinity	42			87		129
Lassen	73					73
Modoc	20					20
Plumas	16					16
Alameda	3,747	7	25	1,216	3,062	8,057
Contra Costa	9,563	1	85	32,364	3,704	45,717
Lake	4,841		1	5,975	159	10,976
Marin	168			88	178	434
Monterey	2,516		3	2,687	119	5,325
Napa	10,983	4	147	1,642	10,648	23,424
San Benito	8,724		1	2,077	1,503	12,305
San Luis Obispo	878	1	3	10,025	729	11,636
San Mateo	178			121	13	312
Santa Clara	74,055	33	43	9,710	5,305	89,146
Santa Cruz	12,777	7	33	99	479	13,395
Sonoma	33,339	3	66	1,385	14,980	49,773
Butte	6,756	873	5,181	19,646	120	32,576
Colusa	4,519	13	45	11,960	164	16,701
Glenn	2,225	775	1,035	5,673	81	9,789
Sacramento	5,583	446	2,083	2,359	5,013	15,484
Solano	15,124	5	156	2,844	748	18,877
Sutter	22,387	3	68	12,169	99	34,726
Tehama	3,282	32	3,470	4,001	132	10,917
Yolo	4,178	19	1,012	10,487	528	16,224
Yuba	5,014	4	838	1,584	42	7,482
Fresno	16,223	3,632	16,207	3,246	163,739	203,047
Kern	2,851	1,468	534	222	30,470	35,545
Kings	2,843		403	792	7,023	11,061
Madera	1,974		2,099	538	19,042	23,653
Merced	8,326	23	9,271	12,109	17,672	47,401
San Joaquin	15,537		866	23,701	57,997	98,101
Stanislaus	22,204	16	607	19,004	18,849	60,680
Tulare	18,319	38,075	10,341	7,160	72,900	146,795
Alpine	6					6
Amador	379		5	190	778	1,352
Calaveras	143	1	263	611	217	1,235
El Dorado	4,884			179	79	5,142
Inyo	62		35		17	114
Mariposa	431		1			432
Mono	3					3
Nevada	1,231			25	73	1,329
Placer	16,610	12	374	454	1,805	19,255
Sierra	9					9
Tuolumne	622			38	4	664
Imperial	2	1,935	196	148	1,220	3,501
Los Angeles	2,004	45,547	4,138	9,817	1,360	62,866
Orange	71	64,043	2,710	1,136	55	68,015
Riverside	4,817	24,331	6,470	6,471	12,237	54,326
San Bernardino	4,087	42,035	706	4,479	31,656	82,963
San Diego	1,361	14,119	12,924	1,227	4,203	33,834
Santa Barbara	171	8,611	1,161	2,958	16	12,917
Ventura	1,370	42,234	1,455	19,675	206	64,940
STATE	362,092	288,310	85,908	253,217	496,181	1,485,708

[1] Includes apples, apricots, cherries, nectarines, peaches, pears, plums, prunes.
[2] Includes grapefruit, lemons, limes, oranges.
[3] Includes avocados, dates, figs, olives, persimmons, pomegranates, quinces.
[4] Includes almonds, chestnuts, filberts, pecans, walnuts.
[5] Includes raisin, table, and wine varieties.

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951

County	APPLES—GRAVENSTEIN			APPLES—OTHERS			APPLES—ALL	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte				10	3	13	10	3
Humboldt	6		6	193		193	199	
Mendocino	65		65	813	53	866	878	53
Shasta				104	16	120	104	16
Siskiyou				30		30	30	
Trinity				12		12	12	
Lassen				23	4	27	23	4
Modoc				20		20	20	
Plumas				16		16	16	
Alameda	1		1	9		9	10	
Contra Costa	8		8	24		24	32	
Lake				8	8	16	8	8
Marin	18	1	19	10		10	28	1
Monterey		1	1	407	360	767	407	361
Napa	85		85	187	14	201	272	14
San Benito				192	51	243	192	51
San Luis Obispo	4		4	157	32	189	161	32
San Mateo	1		1	47	9	56	48	9
Santa Clara				147	33	180	147	33
Santa Cruz	151	5	156	8,705	1,092	9,797	8,856	1,097
Sonoma	7,267	76	7,343	3,409	532	3,941	10,676	608
Butte	7		7	539	55	594	546	55
Colusa	1		1				1	
Glenn								
Sacramento				3		3	3	
Solano	4		4	2		2	6	
Sutter	4		4	26		26	30	
Tehama				102	9	111	102	9
Yolo								
Yuba								
Fresno				140	7	147	140	7
Kern				55		55	55	
Kings								
Madera				62	9	71	62	9
Merced				2		2	2	
San Joaquin				12		12	12	
Stanislaus				1		1	1	
Tulare	8		8	345	171	516	353	171
Alpine				6		6	6	
Amador				59		59	59	
Calaveras	3		3	81	44	125	84	44
El Dorado	1		1	230	72	302	231	72
Inyo				55		55	55	
Mariposa				122	297	419	122	297
Mono				2		2	2	
Nevada	2		2	101	64	165	103	64
Placer	6		6	41	7	48	47	7
Sierra				9		9	9	
Tuolumne	1		1	495	67	562	496	67
Imperial								
Los Angeles	10		10	244	6	250	254	6
Orange				1		1	1	
Riverside		1	1	48	18	66	48	19
San Bernardino	4		4	606	142	748	610	142
San Diego				385	133	518	385	133
Santa Barbara				3	73	76	3	73
Ventura				87	26	113	87	26
STATE	7,657	84	7,741	18,387	3,407	21,794	26,044	3,491

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	APRICOTS			NECTARINES		
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total
Del Norte						
Humboldt						
Mendocino	2		2			
Shasta	1		1			
Siskiyou						
Trinity						
Lassen						
Modoc						
Plumas						
Alameda	2,945	117	3,062			
Contra Costa	3,098	195	3,293	103	7	110
Lake	3		3			
Marin	12		12			
Monterey	1,378	7	1,385			
Napa	46		46			
San Benito	4,124	233	4,357			
San Luis Obispo	154	14	168			
San Mateo	6		6			
Santa Clara	15,725	380	16,105			
Santa Cruz	425	12	437			
Sonoma	38		38			
Butte	34	1	35	21		21
Colusa	382	9	391			
Glenn	246		246			
Sacramento	40		40	1		1
Solano	3,921	149	4,070			
Sutter				42	4	46
Tehama	120		120	5		5
Yolo	1,937	71	2,008	3		3
Yuba	2		2	6		6
Fresno	776	43	819	826	459	1,285
Kern	217		217			
Kings	671	20	691	35	17	52
Madera	118		118	78		78
Merced	462		462	121	23	144
San Joaquin	1,161	3	1,164	86	10	96
Stanislaus	1,952	84	2,036	165	72	237
Tulare	114	9	123	615	405	1,020
Alpine						
Amador	3		3			
Calaveras	1	1	2			
El Dorado				4		4
Inyo						
Mariposa						
Mono						
Nevada						
Placer	14		14	3		3
Sierra						
Tuolumne						
Imperial	2		2			
Los Angeles	213	2	215	14	4	18
Orange	9	3	12			
Riverside	2,284	53	2,337		5	5
San Bernardino	130		130			
San Diego	140	4	144	2		2
Santa Barbara	34	10	44			
Ventura	1,125	3	1,128			
STATE	44,065	1,423	45,488	2,130	1,006	3,136

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	CHERRIES—ROYAL ANN			CHERRIES—OTHERS			CHERRIES—ALL	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt				5		5	5	
Mendocino	3		3	4		4	7	
Shasta				8		8	8	
Siskiyou	2		2	8		8	10	
Trinity								
Lassen								
Modoc								
Plumas								
Alameda	292	12	304	143		143	435	12
Contra Costa	7	7	14	146	126	272	153	133
Lake								
Marin								
Monterey	4		4	124	4	128	128	4
Napa	56	4	60	79	3	82	135	7
San Benito				37	5	42	37	5
San Luis Obispo				2	2	4	2	2
San Mateo								
Santa Clara	798	432	1,230	1,813	519	2,332	2,611	951
Santa Cruz	109		109	178	2	180	287	2
Sonoma	551	30	581	85		85	636	30
Butte	4		4	7		7	11	
Colusa								
Glenn				5		5	5	
Sacramento	20		20	48		48	68	
Solano	47	1	48	278	8	286	325	9
Sutter	21	14	35	122	2	124	143	16
Tehama	3		3	4	2	6	7	2
Yolo				12		12	12	
Yuba	4	2	6	26	9	35	30	11
Fresno					10	10		10
Kern								
Kings								
Madera								
Merced								
San Joaquin	1,036	226	1,262	2,553	369	2,922	3,589	595
Stanislaus	24	3	27	37	1	38	61	4
Tulare				3		3	3	
Alpine								
Amador	2		2	1		1	3	
Calaveras					1	1		1
El Dorado	6		6	114	3	117	120	3
Inyo								
Mariposa								
Mono								
Nevada				9		9	9	
Placer	7		7	110	1	111	117	1
Sierra								
Tuolumne								
Imperial								
Los Angeles	5		5	34	17	51	39	17
Orange								
Riverside	26	2	28	303	47	350	329	49
San Bernardino	2	1	3	25	21	46	27	22
San Diego					1	1		1
Santa Barbara	7		7	13		13	20	
Ventura								
STATE	3,036	734	3,770	6,336	1,153	7,489	9,372	1,887

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	PEACHES—CLINGSTONE			PEACHES—FREESTONE			PEACHES—ALL	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte					2	2		2
Humboldt				14	4	18	14	4
Mendocino				11		11	11	
Shasta	2		2	20	5	25	22	5
Siskiyou	8		8	8		8	16	
Trinity				25		25	25	
Lassen	1		1	24	20	44	25	20
Modoc								
Plumas								
Alameda				4		4	4	
Contra Costa	138	3	141	609	2,569	3,178	747	2,572
Lake				1	8	9	1	8
Marin	1		1	2		2	3	
Monterey				28	1	29	28	1
Napa	4		4	74	8	82	78	8
San Benito	32		32	13		13	45	
San Luis Obispo				6	30	36	6	30
San Mateo				7		7	7	
Santa Clara	127	13	140	163	31	194	290	44
Santa Cruz	2		2	23		23	25	
Sonoma	44	4	48	60	3	63	104	7
Butte	2,188	298	2,486	365	33	398	2,553	331
Colusa	4		4	3		3	7	
Glenn				133	28	161	133	28
Sacramento	204	21	225	73	1	74	277	22
Solano	5		5	2,995	101	3,096	3,000	101
Sutter	12,387	2,324	14,711	273	18	291	12,660	2,342
Tehama	10	5	15	622	95	717	632	100
Yolo	15	47	62	500	11	511	515	58
Yuba	1,977	587	2,564	89	4	93	2,066	591
Fresno	460	46	506	6,981	2,373	9,354	7,441	2,419
Kern	27	3	30	209	73	282	236	76
Kings	409	99	508	1,303	136	1,439	1,712	235
Madera	157	148	305	1,039	59	1,098	1,196	207
Merced	3,339	571	3,910	3,338	317	3,655	6,677	888
San Joaquin	5,634	571	6,205	2,185	311	2,496	7,819	882
Stanislaus	12,767	3,673	16,440	2,932	430	3,362	15,699	4,103
Tulare	4,304	770	5,074	4,148	1,015	5,163	8,452	1,785
Alpine								
Amador	8		8	24		24	32	
Calaveras					2	2		2
El Dorado	68	5	73	35		35	103	5
Inyo	1	1	2	5		5	6	1
Mariposa					2	2		2
Mono								
Nevada				7		7	7	
Placer	570	249	819	448	102	550	1,018	351
Sierra								
Tuolumne								
Imperial								
Los Angeles	33	2	35	707	73	780	740	75
Orange	12	11	23	10	10	20	22	21
Riverside	339	40	379	1,058	98	1,156	1,397	138
San Bernardino	744	7	751	1,717	102	1,819	2,461	109
San Diego	4	1	5	346	80	426	350	81
Santa Barbara				25	5	30	25	5
Ventura				72	5	77	72	5
STATE	46,025	9,499	55,524	32,734	8,165	40,899	78,759	17,664

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	PEARS—BARTLETT			PEARS—OTHERS			PEARS—ALL	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt	4		4	1		1	5	
Mendocino	2,068	121	2,189	22		22	2,090	121
Shasta	2		2	1		1	3	
Siskiyou	4		4	11		11	15	
Trinity	5		5				5	
Lassen				1		1	1	
Modoc								
Plumas								
Alameda	46		46	5		5	51	
Contra Costa	1,918	37	1,955	208	25	233	2,126	62
Lake	3,620	415	4,035	5	23	28	3,625	438
Marin	104		104				104	
Monterey	12	1	13	116		116	128	1
Napa	968	38	1,006	1		1	969	38
San Benito	240	37	277	474	22	496	714	59
San Luis Obispo	215	105	320	2		2	217	105
San Mateo	24	6	30	13		13	37	6
Santa Clara	4,212	500	4,712	2,182	165	2,347	6,394	665
Santa Cruz	620	28	648	296	41	337	916	69
Sonoma	2,067	48	2,115	9	2	11	2,076	50
Butte	38		38	5		5	43	
Colusa	15		15	6		6	21	
Glenn	95		95	107		107	202	
Sacramento	3,909	419	4,328	176	10	186	4,085	429
Solano	2,368	143	2,511	237		237	2,605	143
Sutter	171	20	191		18	18	171	38
Tehama	7	1	8				7	1
Yolo	379	22	401	5		5	384	22
Yuba	755	12	767	95		95	850	12
Fresno	24		24	1		1	25	
Kern	90		90				90	
Kings								
Madera								
Merced	2		2				2	
San Joaquin	85	1	86	5		5	90	1
Stanislaus	16		16	2		2	18	
Tulare	21	4	25				21	4
Alpine								
Amador	41		41	1		1	42	
Calaveras	7	1	8				7	1
El Dorado	3,639	68	3,707	472		472	4,111	68
Inyo								
Mariposa	8	1	9				8	1
Mono				1		1	1	
Nevada	898	51	949	56		56	954	51
Placer	4,991	955	5,946	480	23	503	5,471	978
Sierra								
Tuolumne	50		50	9		9	59	
Imperial								
Los Angeles	523	18	541	11		11	534	18
Orange	2		2				2	
Riverside	15		15	2		2	17	
San Bernardino	31	7	38	3	2	5	34	9
San Diego	157	22	179	21	2	23	178	24
Santa Barbara		1	1					1
Ventura	50	2	52				50	2
STATE	34,516	3,084	37,600	5,042	333	5,375	39,558	3,417

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	PLUMS			PRUNES		
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total
Del Norte				1		1
Humboldt	3		3	3		3
Mendocino	24	2	26	785	30	815
Shasta				82		82
Siskiyou						
Trinity						
Lassen						
Modoc						
Plumas						
Alameda	19		19	151	3	154
Contra Costa	146	16	162	173		173
Lake				653	97	750
Marin				20		20
Monterey	11	62	73			
Napa	6	9	15	8,771	630	9,401
San Benito	3	2	5	3,022	237	3,259
San Luis Obispo		3	3	118	34	152
San Mateo				65		65
Santa Clara	206	16	222	44,255	2,338	46,593
Santa Cruz	391	26	417	665	6	671
Sonoma	174	6	180	18,239	695	18,934
Butte	75	29	104	2,706	351	3,057
Colusa	2		2	3,850	247	4,097
Glenn				1,251	360	1,611
Sacramento	228		228	399	31	430
Solano	654	10	664	3,938	263	4,201
Sutter	723	187	910	4,534	1,497	6,031
Tehama				1,862	435	2,297
Yolo	23		23	1,092	61	1,153
Yuba	348	10	358	847	241	1,088
Fresno	2,904	858	3,762	270	45	315
Kern	2,158	18	2,176	1		1
Kings	109	21	130	19	4	23
Madera	291	5	296		8	8
Merced	121	30	151			
San Joaquin	1,088	99	1,187	101	1	102
Stanislaus	44	1	45			
Tulare	4,407	636	5,043	1,101	243	1,344
Alpine						
Amador	1		1	239		239
Calaveras	1		1	1		1
El Dorado	165	2	167			
Inyo						
Mariposa	1		1			
Mono						
Nevada	41	2	43			
Placer	7,982	577	8,559	44		44
Sierra						
Tuolumne						
Imperial						
Los Angeles	76		76	6	6	12
Orange	10	3	13			
Riverside	366	29	395	79	4	83
San Bernardino	429	114	543			
San Diego	40	23	63			
Santa Barbara						
Ventura						
STATE	23,270	2,796	26,066	99,343	7,867	107,210

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	ORANGES—NAVEL			ORANGES—MISCELLANEOUS			ORANGES—NAVEL AND MISCELLANEOUS	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt								
Mendocino				1		1	1	
Shasta								
Siskiyou								
Trinity								
Lassen								
Modoc								
Plumas								
Alameda	1		1				1	
Contra Costa	1		1				1	
Lake								
Marin								
Monterey								
Napa	1	2	3				1	2
San Benito								
San Luis Obispo								
San Mateo								
Santa Clara	1		1	1		1	2	
Santa Cruz				3		3	3	
Sonoma								
Butte	784	11	795	52	2	54	836	13
Colusa	12		12	1		1	13	
Glenn	736	7	743	6		6	742	7
Sacramento	426		426	9		9	435	
Solano	5		5				5	
Sutter	3		3				3	
Tehama	32		32				32	
Yolo	18		18				18	
Yuba	4		4				4	
Fresno	2,394	371	2,765	64		64	2,458	371
Kern	1,259	36	1,295	74		74	1,333	36
Kings								
Madera								
Merced	15		15				15	
San Joaquin								
Stanislaus	12		12	1		1	13	
Tulare	24,950	704	25,654	33		33	24,983	704
Alpine								
Amador								
Calaveras		1	1					1
El Dorado								
Inyo								
Mariposa								
Mono								
Nevada								
Placer	11		11	1		1	12	
Sierra								
Tuolumne								
Imperial	43	3	46	214	35	249	257	38
Los Angeles	9,777	100	9,877	175		175	9,952	100
Orange	699	12	711				699	12
Riverside	11,249	118	11,367	624	227	851	11,873	345
San Bernardino	21,014	87	21,101	826	2	828	21,840	89
San Diego	693	21	714	31	12	43	724	33
Santa Barbara	17	3	20	1	7	8	18	10
Ventura	1,587	77	1,664	2		2	1,589	77
STATE	75,744	1,553	77,297	2,119	285	2,404	77,863	1,838

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	ORANGES—VALENCIA			ORANGES—ALL		
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total
Del Norte						
Humboldt						
Mendocino	1		1	2		2
Shasta						
Siskiyou						
Trinity						
Lassen						
Modoc						
Plumas						
Alameda	1		1	2		2
Contra Costa				1		1
Lake						
Marin						
Monterey						
Napa		1	1	1	3	4
San Benito						
San Luis Obispo						
San Mateo						
Santa Clara				2		2
Santa Cruz				3		3
Sonoma						
Butte	7		7	843	13	856
Colusa				13		13
Glenn	20		20	762	7	769
Sacramento	10		10	445		445
Solano				5		5
Sutter				3		3
Tehama				32		32
Yolo	1		1	19		19
Yuba				4		4
Fresno	562	6	568	3,020	377	3,397
Kern	58		58	1,391	36	1,427
Kings						
Madera						
Merced	5		5	20		20
San Joaquin						
Stanislaus	3		3	16		16
Tulare	10,765	176	10,941	35,748	880	36,628
Alpine						
Amador						
Calaveras					1	1
El Dorado						
Inyo						
Mariposa						
Mono						
Nevada						
Placer				12		12
Sierra						
Tuolumne						
Imperial	459	2	461	716	40	756
Los Angeles	23,362	1,008	24,370	33,314	1,108	34,422
Orange	55,771	2,200	57,971	56,470	2,212	58,682
Riverside	4,940	241	5,181	16,813	586	17,399
San Bernardino	11,099	110	11,209	32,939	199	33,138
San Diego	6,366	731	7,097	7,090	764	7,854
Santa Barbara	83		83	101	10	111
Ventura	17,033	1,984	19,017	18,622	2,061	20,683
STATE	130,546	6,459	137,005	208,409	8,297	216,706

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	GRAPEFRUIT			LEMONS			LIMES	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt								
Mendocino								
Shasta								
Siskiyou								
Trinity								
Lassen								
Modoc								
Plumas								
Alameda				5		5		
Contra Costa								
Lake								
Marin								
Monterey								
Napa								
San Benito								
San Luis Obispo				1		1		
San Mateo								
Santa Clara				29		29	2	
Santa Cruz				4		4		
Sonoma				3		3		
Butte	1		1	16		16		
Colusa								
Glenn	6		6					
Sacramento	1		1					
Solano								
Sutter								
Tehama								
Yolo								
Yuba								
Fresno	37		37	196		196	2	
Kern	30	3	33	8		8		
Kings								
Madera								
Merced					3	3		
San Joaquin								
Stanislaus								
Tulare	338		338	1,005	93	1,098	11	
Alpine								
Amador								
Calaveras								
El Dorado								
Inyo								
Mariposa								
Mono								
Nevada								
Placer								
Sierra								
Tuolumne								
Imperial	1,111		1,111	68		68		
Los Angeles	770	1	771	10,092	221	10,313	40	1
Orange	233	4	237	4,794	296	5,090	34	
Riverside	3,227	304	3,531	3,192	203	3,395	6	
San Bernardino	3,115	15	3,130	5,492	271	5,763	4	
San Diego	263	1	264	5,396	374	5,770	231	
Santa Barbara				7,090	1,396	8,486	14	
Ventura	327	19	346	16,918	4,287	21,205		
STATE	9,459	347	9,806	54,309	7,144	61,453	344	1

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	OLIVES			DATES			AVOCADOS	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt								
Mendocino	7		7					
Shasta	711	45	756					
Siskiyou								
Trinity								
Lassen								
Modoc								
Plumas								
Alameda	25		25					
Contra Costa	27		27					
Lake	1		1					
Marin								
Monterey	3		3					
Napa	139	4	143					
San Benito	1		1					
San Luis Obispo	3		3					
San Mateo								
Santa Clara	21	10	31					
Santa Cruz							2	10
Sonoma	34	1	35					
Butte	4,559	493	5,052				1	3
Colusa	8	27	35					
Glenn	705	128	833					
Sacramento	1,823	1	1,824					
Solano	15		15					
Sutter	57	5	62					
Tehama	2,892	526	3,418					
Yolo	378	37	415					
Yuba	691	12	703					
Fresno	1,004	119	1,123				2	
Kern	418	87	505					
Kings	399		399					
Madera	539	95	634					
Merced	125	1	126					
San Joaquin	355	82	437					
Stanislaus	423	1	424					
Tulare	7,458	1,740	9,198				1	
Alpine								
Amador	5		5					
Calaveras	230	33	263					
El Dorado								
Inyo				35		35		
Mariposa	1		1					
Mono								
Nevada								
Placer	273	4	277					
Sierra								
Tuolumne								
Imperial				184	12	196		
Los Angeles	1,084	30	1,114				2,504	284
Orange	72	27	99				1,676	775
Riverside	1,153	79	1,232	4,071	816	4,887	52	173
San Bernardino	469	136	605	8		8	51	20
San Diego	1,041	8	1,049	30	4	34	7,609	4,163
Santa Barbara	266		266				417	477
Ventura	18		18				512	925
STATE	27,433	3,731	31,164	4,328	832	5,160	12,827	6,830

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	FIGS—KADOTA			FIGS—OTHERS			FIGS—ALL	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt				1		1	1	
Mendocino				1		1	1	
Shasta	1		1	1		1	2	
Siskiyou								
Trinity								
Lassen								
Modoc								
Plumas								
Alameda								
Contra Costa	56		56				56	
Lake								
Marin								
Monterey								
Napa				4		4	4	
San Benito								
San Luis Obispo								
San Mateo								
Santa Clara				6		6	6	
Santa Cruz				2		2	2	
Sonoma				29		29	29	
Butte	19		19	85		85	104	
Colusa				10		10	10	
Glenn	156		156	43		43	199	
Sacramento	52		52	48		48	100	
Solano	4		4	129	8	137	133	8
Sutter								
Tehama	3		3	49		49	52	
Yolo				596	1	597	596	1
Yuba				132		132	132	
Fresno	722	3	725	13,237	882	14,119	13,959	885
Kern				5		5	5	
Kings								
Madera	19		19	706	740	1,446	725	740
Merced	3,163	38	3,201	5,715	211	5,926	8,878	249
San Joaquin	379		379	31		31	410	
Stanislaus	112		112	52		52	164	
Tulare	572		572	276		276	848	
Alpine								
Amador								
Calaveras								
El Dorado								
Inyo								
Mariposa								
Mono								
Nevada								
Placer								
Sierra								
Tuolumne								
Imperial								
Los Angeles	67		67	119	15	134	186	15
Orange								
Riverside				87	10	97	87	10
San Bernardino								
San Diego				3	17	20	3	17
Santa Barbara								
Ventura								
STATE	5,325	41	5,366	21,367	1,884	23,251	26,692	1,925

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	PERSIMMONS			POMEGRANATES			QUINCES	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt								
Mendocino								
Shasta	80		80					
Siskiyou								
Trinity								
Lassen								
Modoc								
Plumas								
Alameda								
Contra Costa							2	
Lake								
Marin								
Monterey								
Napa								
San Benito								
San Luis Obispo								
San Mateo								
Santa Clara	6		6					
Santa Cruz	17	2	19					
Sonoma							2	
Butte	21		21					
Colusa								
Glenn	3		3					
Sacramento	7		7				152	
Solano								
Sutter	6		6					
Tehama								
Yolo								
Yuba	3		3					
Fresno	49		49	186	3	189		
Kern	7	5	12	12		12		
Kings	4		4					
Madera								
Merced	8		8	10		10		
San Joaquin	8		8				11	
Stanislaus	11		11	6		6	2	
Tulare	39	26	65	188	34	222	7	
Alpine								
Amador								
Calaveras								
El Dorado								
Inyo								
Mariposa								
Mono								
Nevada								
Placer	88	1	89					
Sierra							8	
Tuolumne								
Imperial								
Los Angeles	33	2	35					
Orange	147	13	160					
Riverside	29		29					
San Bernardino	22		22					
San Diego	47	1	48				1	
Santa Barbara	1		1					
Ventura								
STATE	636	50	686	402	37	439	185	

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	ALMONDS			CHESTNUTS			FILBERTS	
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total	Bearing	Non-bearing
Del Norte								
Humboldt				34		34		
Mendocino				5		5	1	
Shasta	5	6	11					
Siskiyou								
Trinity								
Lassen								
Modoc								
Plumas								
Alameda	92	1	93	4		4		
Contra Costa	7,717	9,102	16,819					
Lake	273	16	289	1		1		
Marin	7		7					
Monterey	1,565	5	1,570					
Napa	2		2					
San Benito	23	3	26					
San Luis Obispo	8,206	780	8,986					
San Mateo	4		4					
Santa Clara	188	12	200				1	
Santa Cruz	1		1	46	2	48	2	
Sonoma	7		7	4		4	15	4
Butte	13,657	2,332	15,989	1		1	10	
Colusa	9,336	1,404	10,740	2		2		
Glenn	4,226	613	4,839					
Sacramento	905	72	977					
Solano	1,935	292	2,227					
Sutter	4,673	1,405	6,078					
Tehama	1,669	360	2,029					
Yolo	8,909	705	9,614					
Yuba	255	397	652					
Fresno	701	671	1,372					
Kern	131	44	175					
Kings	3		3					
Madera	343	146	489					
Merced	7,372	2,099	9,471	1	1	2		
San Joaquin	8,801	1,552	10,353	116	6	122	1	
Stanislaus	6,523	1,191	7,714	5	5	10		
Tulare	314	14	328					
Alpine								
Amador	43		43	3		3		
Calaveras	142	11	153	15		15		
El Dorado	5		5	10		10		
Inyo								
Mariposa								
Mono								
Nevada				5		5	5	
Placer	397	29	426					
Sierra								
Tuolumne				14	3	17		
Imperial								
Los Angeles	1,864	373	2,237					
Orange				1		1		
Riverside	249	28	277					
San Bernardino	66	16	82					
San Diego	5	14	19					
Santa Barbara	59	2	61					
Ventura	201	4	205					
STATE	90,874	23,699	114,573	267	17	284	35	4

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	PECANS			WALNUTS		
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total
Del Norte						
Humboldt				72		72
Mendocino				449	186	635
Shasta		1	1	59	15	74
Siskiyou				5		5
Trinity				87		87
Lassen						
Modoc						
Plumas						
Alameda				857	262	1,119
Contra Costa	2		2	13,298	2,245	15,543
Lake				4,593	1,092	5,685
Marin				72	9	81
Monterey				752	365	1,117
Napa				1,487	153	1,640
San Benito				1,657	394	2,051
San Luis Obispo				697	342	1,039
San Mateo				96	21	117
Santa Clara				8,235	1,274	9,509
Santa Cruz				43	5	48
Sonoma				1,073	282	1,355
Butte	22	2	24	2,504	1,118	3,622
Colusa	2	1	3	882	333	1,215
Glenn	7	9	16	769	49	818
Sacramento	6	1	7	1,251	124	1,375
Solano				549	68	617
Sutter	10	2	12	3,109	2,970	6,079
Tehama	6		6	1,106	860	1,966
Yolo				737	136	873
Yuba	3		3	681	248	929
Fresno	24	4	28	1,324	522	1,846
Kern	25		25		22	22
Kings	1	1	2	579	208	787
Madera				47	2	49
Merced	23		23	2,096	517	2,613
San Joaquin				11,745	1,480	13,225
Stanislaus	23	10	33	7,292	3,955	11,247
Tulare	38	57	95	4,176	2,561	6,737
Alpine						
Amador				144		144
Calaveras		1	1	399	43	442
El Dorado				105	59	164
Inyo						
Mariposa						
Mono						
Nevada				15		15
Placer				28		28
Sierra						
Tuolumne				21		21
Imperial	148		148			
Los Angeles	76		76	7,408	96	7,504
Orange	1		1	1,124	10	1,134
Riverside	141	4	145	5,632	417	6,049
San Bernardino	4		4	4,340	53	4,393
San Diego	32	2	34	1,055	119	1,174
Santa Barbara				2,103	794	2,897
Ventura				17,111	2,359	19,470
STATE	594	95	689	111,864	25,768	137,632

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	GRAPES—RAISIN			GRAPES—TABLE		
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total
Del Norte						
Humboldt	3		3			
Mendocino	5		5	15		15
Shasta	2		2	3		3
Siskiyou						
Trinity						
Lassen						
Modoc						
Plumas						
Alameda	16		16	9	7	16
Contra Costa	36		36	70	1	71
Lake				1		1
Marin				2		2
Monterey				3		3
Napa	37		37	79		79
San Benito	11		11	15		15
San Luis Obispo	4		4	11		11
San Mateo				2		2
Santa Clara				29		29
Santa Cruz	3		3	33		33
Sonoma	4		4	22	2	24
Butte	21		21	59		59
Colusa	79		79	6		6
Glenn	36		36			
Sacramento	162	1	163	3,466		3,466
Solano	63		63	21		21
Sutter	64		64			
Tehama	3		3	13		13
Yolo	74		74	10		10
Yuba						
Fresno	131,257	4,767	136,024	15,375	962	16,337
Kern	14,416	359	14,775	10,834	415	11,249
Kings	6,003	162	6,165	138		138
Madera	14,620	55	14,675	500		500
Merced	10,192	85	10,277	2,550	2	2,552
San Joaquin	847	78	925	23,524	286	23,810
Stanislaus	7,075	154	7,229	986	2	988
Tulare	33,328	549	33,877	30,702	1,294	31,996
Alpine						
Amador	16		16	10		10
Calaveras	12		12	2		2
El Dorado						
Inyo				15		15
Mariposa						
Mono						
Nevada	6		6	14		14
Placer	11		11	148		148
Sierra						
Tuolumne						
Imperial	798	162	960	42	218	260
Los Angeles	204		204	479	10	489
Orange	3		3	49		49
Riverside	5,628	1,771	7,399	353	536	889
San Bernardino	3,242		3,242	1,363		1,363
San Diego	2,098	103	2,201	462	194	656
Santa Barbara				3	1	4
Ventura				191		191
STATE	230,379	8,246	238,625	91,609	3,930	95,539

CALIFORNIA FRUIT AND NUT ACREAGE ESTIMATES BY COUNTIES AND STATE TOTALS AS OF 1951—Continued

County	GRAPES—WINE			GRAPES—ALL		
	Bearing	Non-bearing	Total	Bearing	Non-bearing	Total
Del Norte						
Humboldt				3		3
Mendocino	6,367	335	6,702	6,387	335	6,722
Shasta	25		25	30		30
Siskiyou	2		2	2		2
Trinity						
Lassen						
Modoc						
Plumas						
Alameda	2,884	146	3,030	2,909	153	3,062
Contra Costa	3,570	27	3,597	3,676	28	3,704
Lake	158		158	159		159
Marin	176		176	178		178
Monterey	116		116	119		119
Napa	10,238	294	10,532	10,354	294	10,648
San Benito	1,294	183	1,477	1,320	183	1,503
San Luis Obispo	589	125	714	604	125	729
San Mateo	11		11	13		13
Santa Clara	4,976	300	5,276	5,005	300	5,305
Santa Cruz	443		443	479		479
Sonoma	14,746	206	14,952	14,772	208	14,980
Butte	40		40	120		120
Colusa	79		79	164		164
Glenn	45		45	81		81
Sacramento	1,384		1,384	5,012	1	5,013
Solano	664		664	748		748
Sutter	35		35	99		99
Tehama	116		116	132		132
Yolo	444		444	528		528
Yuba	42		42	42		42
Fresno	10,819	559	11,378	157,451	6,288	163,739
Kern	4,368	78	4,446	29,618	852	30,470
Kings	698	22	720	6,839	184	7,023
Madera	3,860	7	3,867	18,980	62	19,042
Merced	4,802	41	4,843	17,544	128	17,672
San Joaquin	32,992	270	33,262	57,363	634	57,997
Stanislaus	10,359	273	10,632	18,420	429	18,849
Tulare	6,859	168	7,027	70,889	2,011	72,900
Alpine						
Amador	752		752	778		778
Calaveras	200	3	203	214	3	217
El Dorado	79		79	79		79
Inyo	2		2	17		17
Mariposa						
Mono						
Nevada	53		53	73		73
Placer	1,619	27	1,646	1,778	27	1,805
Sierra						
Tuolumne	4		4	4		4
Imperial				840	380	1,220
Los Angeles	667		667	1,350	10	1,360
Orange	3		3	55		55
Riverside	3,949		3,949	9,930	2,307	12,237
San Bernardino	26,744	307	27,051	31,349	307	31,656
San Diego	1,339	7	1,346	3,899	304	4,203
Santa Barbara	12		12	15	1	16
Ventura	15		15	206		206
STATE	158,639	3,378	162,017	480,627	15,554	496,181

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
ALMONDS																		
Drake			29	53	41	87	70	35	76	64	81	236	828	617	6,912	9,129	8,915	214
IXL	4	559	22	32	58	90	73	61	64	48	80	107	494	372	5,459	7,523	6,748	775
Jordanola	1,576	1,563	386	512	475	431	268	92	112	123	171	513	185	15	99	6,521	1,607	4,914
Lewelling	66	53	1		4	8	10		25	5	3	10	10	8	192	395	263	132
Mission[1]	501	962	350	569	816	996	695	539	655	722	723	1,256	3,273	1,107	6,859	20,023	15,887	4,136
Ne Plus Ultra	237	986	220	352	373	343	319	238	232	380	411	662	2,165	951	6,158	14,027	11,429	2,598
Nonpareil	1,784	1,720	1,148	1,272	1,637	1,788	1,313	979	966	1,197	1,219	2,225	8,078	4,428	17,156	46,730	37,401	9,329
Peerless	58	86	113	181	238	242	161	156	117	111	118	399	939	571	2,423	5,913	5,012	901
Other almonds	1	349	82	89	76	79	87	122	125	77	83	112	308	316	2,406	4,312	3,612	700
All almonds	4,227	6,278	2,351	3,060	3,718	4,064	2,996	2,222	2,372	2,727	2,889	5,520	16,280	8,205	47,664	114,573	90,874	23,699
APPLES																		
Astrachan				32	15	76	21	26	6	14	22	20	65	33	73	403	259	144
Bellflower							5	3	1				11	3	1,024	1,047	1,042	5
Delicious[2]	63	110	115	145	281	516	260	280	141	185	121	247	849	484	1,404	5,201	3,711	1,490
Golden Delicious	19	8	12	49	115	113	49	26	11	28	9	22	99	30	200	790	425	365
Gravenstein	9	1	1	2	11	34	26	3	5	6	5	26	119	214	7,279	7,741	7,657	84
Jonathan	13	6	30	45	77	35	24	30	26	8	5	22	98	88	806	1,313	1,083	230
Newtown	16	17	39	37	204	122	32	59	71	23	67	44	314	267	4,761	6,073	5,606	467
Rome Beauty	20	44	14	23	43	77	49	19	21	15	11	39	135	135	942	1,587	1,317	270
White Pearmain	2					11			1	4			14	28	295	355	342	13
Winesap	3	3	2	7	6	33	13	7	7	3	2	7	27	57	492	669	602	67
Other apples	12	16	56	53	77	83	59	41	17	10	9	36	175	258	3,454	4,356	4,000	356
All apples	157	205	269	393	829	1,100	538	494	307	296	251	463	1,906	1,597	20,730	29,535	26,044	3,491
APRICOTS																		
Blenheim and Royal	83	139	201	286	603	342	490	351	379	473	366	856	3,343	2,753	26,717	37,382	36,226	1,156
Moorpark and Hemskirk		1	1	11		5	4	2	5	1	7	15	21	16	849	938	925	13
Tilton	14	13	22	116	94	126	76	65	135	109	157	88	956	628	3,244	5,843	5,655	188
Other apricots	4	29	19	12	20	16	10	14	32	12	10	19	59	210	859	1,325	1,259	66
All apricots	101	182	243	425	717	489	580	432	551	595	540	978	4,379	3,607	31,669	45,488	44,065	1,423

* See discussion in introduction.
[1] Synonymous with "Texas."
[2] All red varieties.

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY—Continued

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
AVOCADOS																		
Anaheim	1	2	13	30	22	28	10	15	14	3	6	8	41	100	64	357	289	68
Dickinson					1	1						2	4	25	33	66	65	1
Fuerte	415	476	1,060	1,830	1,160	945	605	624	359	387	474	341	1,553	2,899	2,085	15,213	10,272	4,941
Lyon								3				2	7	10	12	34	34	
Nabal		3	4	7	5	6	4	5	6	4	8	7	47	110	50	266	247	19
Puebla										1			5	32	73	111	111	
Other avocados	272	367	481	405	276	231	97	119	44	77	74	129	320	335	383	3,610	1,809	1,801
All avocados	688	848	1,558	2,272	1,464	1,211	716	766	423	472	562	489	1,977	3,511	2,700	19,657	12,827	6,830
CHERRIES																		
Bing	17	138	252	171	239	68	145	49	61	57	48	63	313	569	2,027	4,217	3,377	840
Black Republican	4	3	8	3		2	1		1	1	4	2	14	34	151	228	208	20
Chapman	3	4	2	3	8	3	1	4	1	6	1	26	33	74	136	305	285	20
Lambert	2	13	11	6	17	3	15	2		2	2	2	33	96	302	506	457	49
Royal Ann	73	80	282	152	124	49	30	42	35	34	38	59	189	389	2,194	3,770	3,036	734
Tartarian	13	9	47	25	35	19	9	17	12	15	12	15	99	244	1,112	1,683	1,543	140
Other cherries	7	27	22	8	15	5	21	11	3	4	5	8	40	73	301	550	466	84
All cherries	119	274	624	368	438	149	222	125	113	119	110	175	721	1,479	6,223	11,259	9,372	1,887
CHESTNUTS—all varieties			1	8	3	1	3	1	1	6	3	3	30	81	143	284	267	17
DATES																		
Deglet Noor	27	11	4	57	204	378	146	173	93	86	79	110	689	915	1,271	4,243	3,562	681
Khadrawy	2				7	8	1	1	4		7	27	40	18	44	159	142	17
Saidy													8	17	75	100	100	
Zahidi		1		18	28	8	14	9	3	5	2	10	30	32	52	212	157	55
Other varieties	3		2	25	26	23	12	4	3	1	4	13	69	51	210	446	367	79
All dates	32	12	6	100	265	417	173	187	103	92	92	160	836	1,033	1,652	5,160	4,328	832

* See discussion in introduction.

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY—Continued

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
FIGS																		
Black varieties				10	213	185	122		35		1	14	51	55	3,315	4,001	3,475	526
Calimyrna		8		82	40		8		15	5			45	19	10,379	10,601	10,463	138
Kadota				41	118	109	282	339	20	20	19	4	190	145	4,079	5,366	5,325	41
White Adriatic	6	27	45	126	228	267	487	174	202	85	122	70	131	75	6,284	8,329	7,143	1,186
Other figs	2		7	7	10	8	2	11	1	5	7	7	25	45	183	320	286	34
All figs	8	35	52	266	609	569	901	524	273	115	149	95	442	339	24,240	28,617	26,692	1,925
FILBERTS—all varieties				2	2		2	6	3			4	8	9	3	39	35	4
GRAPES—RAISIN																		
Muscat	536	321	177	373	1,166	575	916	474	277	412	302	417	1,420	624	29,404	37,394	36,360	1,034
Sultana		11	10	4			3	2		1		20	115	150	3,748	4,064	4,043	21
Thompson Seedless	2,356	2,207	2,556	4,315	7,419	6,655	6,486	3,805	2,573	2,987	3,170	4,711	20,480	14,715	110,158	194,593	187,474	7,119
Zante Currant	2	10	42	28	137	65	50	24	62	115	87	165	664	530	487	2,468	2,414	54
Other raisin varieties			18							7			2	21	58	106	88	18
All raisin varieties	2,894	2,549	2,803	4,720	8,722	7,295	7,455	4,305	2,912	3,522	3,559	5,313	22,681	16,040	143,855	238,625	230,379	8,246
GRAPES—TABLE																		
Cardinal	406	524	731	665	170	181	51	10				6	5	22	47	2,818	1,157	1,661
Concord[1]	1	1	10	55	12	49	24	7	6	11	15	23	57	54	153	478	466	12
Emperor	86	464	326	613	2,064	2,305	3,352	1,926	775	953	442	1,433	5,126	2,980	12,026	34,871	33,995	876
Malaga	6	12	10	14	44	252	230	107	33	12	34	41	278	554	9,115	10,742	10,714	28
Red Malaga	18	65	202	482	782	393	455	647	165	66	120	189	877	475	2,192	7,128	6,843	285
Ribier	88	2	13	255	329	420	424	296	142	130	226	123	1,205	874	1,955	6,482	6,379	103
Tokay	149	33	67	190	503	548	871	740	356	348	389	470	1,484	931	20,368	27,447	27,198	249
Other table varieties	306	214	189	176	83	309	304	205	78	131	110	78	359	152	2,879	5,573	4,857	716
All table varieties	1,060	1,315	1,548	2,450	3,987	4,457	5,711	3,938	1,555	1,651	1,336	2,363	9,391	6,042	48,735	95,539	91,609	3,930

* See discussion in introduction.

[1] Concord and other American type grapes.

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY—Continued

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
GRAPES—WINE																		
Alicante Bouschet	40	20	37	47	268	463	419	263	57	34	85	96	717	1,619	13,462	17,627	17,530	97
Burger	------	------	4	92	76	131	460	329	223	39	37	48	662	216	1,381	3,698	3,694	4
Carignane	399	226	198	708	1,128	1,866	2,432	1,312	659	542	446	638	2,196	3,014	17,332	33,096	32,268	828
Colombar	13	9	17	100	157	83	62	8	25	38	16	20	149	68	417	1,182	1,137	45
Franken Riesling	------	23	24	42	181	102	140	42	15	38	54	27	80	53	308	1,129	1,082	47
Golden Chasselas	19	7	20	124	621	324	688	557	128	311	94	235	883	541	1,448	6,000	5,951	49
Grenache	88	58	81	335	885	703	1,663	651	296	809	168	267	634	242	2,428	9,308	9,073	235
Mataro	------	26	6	1	10	105	32	11	11	7	------	58	222	587	4,104	5,180	5,147	33
Mission	9	29	------	217	357	552	1,315	347	247	304	155	276	1,070	341	6,302	11,521	11,464	57
Palomino	------	5	11	30	537	826	1,693	429	168	160	71	41	545	223	523	5,362	5,346	16
Petite Sirah	32	24	44	51	53	72	90	152	48	61	55	70	169	252	3,986	5,160	5,052	108
Sauvignon Blanc	------	7	42	81	103	160	113	80	61	75	24	95	213	136	554	1,744	1,638	106
Zinfandel	237	114	167	366	528	652	779	492	384	385	466	746	2,523	3,387	28,297	39,523	38,975	548
Other white varieties	24	75	111	183	353	516	1,151	924	472	261	103	139	1,324	909	2,629	9,174	8,936	238
Other dark varieties	156	496	261	366	869	809	931	834	340	213	133	250	1,053	473	5,129	12,313	11,346	967
All wine varieties	1,017	1,119	1,023	2,743	6,126	7,364	11,968	6,431	3,134	3,277	1,907	3,006	12,440	12,162	88,300	162,017	158,639	3,378
GRAPEFRUIT																		
Marsh	7	------	9	22	28	72	41	35	39	40	40	112	1,586	2,853	4,271	9,155	9,089	66
Other grapefruit	79	41	13	103	45	54	------	9	3	2	1	7	67	47	180	651	370	281
All grapefruit	86	41	22	125	73	126	41	44	42	42	41	119	1,653	2,900	4,451	9,806	9,459	347
LEMONS																		
Eureka	576	1,336	1,735	1,618	1,290	979	612	710	643	807	1,215	2,695	11,122	9,995	19,392	54,725	48,170	6,555
Lisbon	36	43	26	46	143	56	15	40	23	75	49	200	667	677	2,618	4,714	4,400	314
Villa Franca	19	22	13	38	41	14	20	8	1	16	5	37	348	146	499	1,227	1,094	133
Other lemons	20	12	2	105	3	11	3	3	2	2	8	47	126	43	400	787	645	142
All lemons	651	1,413	1,776	1,807	1,477	1,060	650	761	669	900	1,277	2,979	12,263	10,861	22,909	61,453	54,309	7,144
LIMES—all varieties	------	------	------	------	2	7	4	9	29	24	15	26	156	65	8	345	344	1

* See discussion in introduction.

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY—Continued

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
NECTARINES																		
Gower	34	24	2	3	25	13	10	12	7	11	37	30	144	105	68	525	462	63
Quetta	45	15	26	18	19	13	22	23	2	19	15	21	81	67	93	479	375	104
Rivers	201	34	23	19	10	11	10	17	41	49	67	155	266	98	10	1,011	734	277
Stanwick		6									6	6	60	17	54	149	143	6
Other nectarines	156	178	158	64	62	45	42	26	68	5	1	18	107	24	18	972	416	556
All nectarines	436	257	209	104	116	82	84	78	118	84	126	230	658	311	243	3,136	2,130	1,006
OLIVES																		
Ascolano			37		5	20	22	24	4	28	2	16	2	2	624	786	702	84
Barouni				2	2			7				2	2	2	289	306	302	4
Manzanillo	198	248	120	285	289	317	488	406	245	285	84	197	144	215	6,186	9,707	7,754	1,953
Mission	3	38	25	54	134	126	225	65	64	106	40	74	182	242	13,067	14,445	13,840	605
Sevillano	18	156	50	113	186	295	130	124	35	32	43	113	130	127	3,215	4,767	3,819	948
Other olives	11	35	1	38	16	6	30	40	10	1	7	16	17	48	877	1,153	1,016	137
All olives	230	477	233	492	632	764	895	666	358	452	176	418	477	636	24,258	31,164	27,433	3,731
ORANGES																		
Valencia	105	320	695	2,632	2,652	2,310	1,801	1,525	1,097	1,453	1,260	2,505	10,613	19,632	88,405	137,005	130,546	6,459
Navel	108	209	242	470	376	258	171	346	261	226	213	394	2,536	4,670	66,817	77,297	75,744	1,553
Tangerines	41	55	67	44	59	106	2	14	15	71	5	20	75	124	271	969	703	266
Other varieties				10	1	1	5		1	7	6	4	38	24	1,091	1,188	1,176	12
Seedlings			7											1	239	247	240	7
Navel and miscellaneous	149	264	316	524	436	365	178	360	277	304	224	418	2,649	4,819	68,418	79,701	77,863	1,838
All oranges	254	584	1,011	3,156	3,088	2,675	1,979	1,885	1,374	1,757	1,484	2,923	13,262	24,451	156,823	216,706	208,409	8,297

* See discussion in introduction.

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY—Continued

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
PEACHES—CLINGSTONE																		
Andora	50	43	181	247	85	60	84	196	187	64	9	15	52	4	3	1,280	759	521
Carolyn	39	77	97	229	160	113	127	252	107	203	20	29	38		6	1,497	1,055	442
Cortez	263	373	471	290	241	166	120	16					32	2		1,974	577	1,397
Fortuna	73	125	351	266	420	392	501	800	332	165	170	45	20		13	3,673	2,858	815
Gaume	180	118	188	61	87	51	142	119	128	507	423	537	2,956	881	692	7,070	6,523	547
Halford	321	394	460	289	218	184	256	552	495	801	806	814	3,570	669	324	10,153	8,689	1,464
Johnson	21	20	88	53	78	68	82	107	66	219	146	240	740	53	103	2,084	1,902	182
Libbee								6	1	22	47	37	618	31	27	789	789	
Palora	198	141	468	200	161	87	140	189	146	335	331	317	1,205	578	1,602	6,098	5,091	1,007
Peak	32	102	139	138	160	91	98	224	194	261	348	407	1,189	247	604	4,234	3,823	411
Phillips		5	15	17	8	72	38	34	109	162	64	101	160	86	1,935	2,806	2,769	37
Sims	33	49	21	30	36	60	63	72	95	177	236	271	934	242	613	2,932	2,799	133
Stuart-Gomes	162	146	275	253	137	204	236	352	443	363	207	135	243	39	35	3,230	2,394	836
Other clingstones	228	410	683	380	382	343	548	514	356	597	548	591	1,195	204	725	7,704	5,997	1,707
All clingstones	1,600	2,003	3,437	2,453	2,173	1,891	2,435	3,433	2,659	3,876	3,355	3,539	12,952	3,036	6,682	55,524	46,025	9,499
PEACHES—FREESTONE																		
Babcock		13	4	3	5	29	20	41	18	36	38	82	264	33	20	606	586	20
Crawford			15	2		1	1			1	2	5	5	1	37	70	53	17
Elberta	1,005	309	299	321	712	1,166	850	609	491	430	448	782	3,397	1,637	3,802	16,258	14,320	1,938
Early Elberta	481	189	121	135	235	344	396	272	172	197	225	302	541	82	291	3,983	3,057	926
J. H. Hale	1,427	780	155	81	166	242	147	150	98	81	63	100	579	446	800	5,315	2,871	2,444
Lovell	3	5	1	3	51	105	35	47	38	45	45	148	1,301	439	1,062	3,328	3,316	12
Muir		1		5	13	25	37	17	13	27	12	58	458	242	689	1,597	1,591	6
Rio Oso Gem	215	129	151	173	283	334	329	206	166	193	93	175	424	59	25	2,955	2,287	668
Salway		2		5	6	6	2			1	2	7	22	31	14	98	91	7
Other freestones	851	492	431	351	825	466	369	283	233	151	317	176	892	382	470	6,689	4,562	2,127
All freestones	3,982	1,920	1,177	1,079	2,296	2,718	2,186	1,625	1,229	1,162	1,245	1,835	7,883	3,352	7,210	40,899	32,734	8,165
PEACHES, all	5,582	3,923	4,614	3,532	4,469	4,609	4,621	5,058	3,888	5,038	4,600	5,374	20,835	6,388	13,892	96,423	78,759	17,664

* See discussion in introduction.

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY—Continued

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
PEARS																		
Bartlett	442	337	679	564	515	405	275	197	162	262	112	353	1,391	2,760	29,146	37,600	34,516	3,084
Beurre Bosc				1	1							9	16	73	504	604	602	2
Beurre Hardy	22	22	34	65	36	40	43	21	7	24	3	25	181	200	1,465	2,188	1,954	234
Comice			5	7	30	4	3			4	7	3	19	40	669	791	742	49
D'Anjou			23	1							1	11	9	38	191	274	250	24
Winter Nelis							2					10	21	55	824	912	910	2
Other pears		8		6	4	1	3	1	3	3		2	60	75	440	606	584	22
Other than Bartlett	22	30	62	80	71	45	51	22	10	31	11	60	306	481	4,093	5,375	5,042	333
All pears	464	367	741	644	586	450	326	219	172	293	123	413	1,697	3,241	33,239	42,975	39,558	3,417
PECANS—all varieties	2	6	6	12	7	35	22	5	14	4	42	15	112	243	164	689	594	95
PERSIMMONS																		
Hachiya		7	20	12	11	3			2		3	11	73	95	357	594	544	50
Other persimmons												10	36	11	35	92	92	
All persimmons		7	20	12	11	3			2		3	21	109	106	392	686	636	50
PLUMS																		
Beauty	114	109	100	54	98	103	120	184	96	12	11	46	362	292	991	2,692	2,315	377
Burbank			2	5	2	4	3	1		9	1	15	69	83	433	627	620	7
Climax					1			5	1				12	11	172	202	202	
Duarte	66	38	127	117	125	242	174	139	120	105	44	118	365	394	781	2,955	2,600	355
Grand Duke								1					4	7	46	58	58	
Kelsey		3	5	9	6	15	8	45	6	5	4	17	121	160	465	869	852	17
President	30	49	58	44	86	74	121	98	86	49	18	73	191	228	844	2,049	1,867	182
Santa Rosa	273	154	176	301	404	530	721	744	612	387	471	477	945	576	2,305	9,076	8,103	973
Tragedy	8	23	11	15	25	4	23	40	8	19	30	46	89	91	287	719	662	57
Wickson		18	19	4		4	62	6	1	4		15	89	149	517	888	847	41
Other plums	105	212	209	234	296	364	327	244	177	208	106	306	1,002	561	1,580	5,931	5,144	787
All plums	596	606	707	783	1,043	1,340	1,559	1,507	1,107	798	685	1,113	3,249	2,552	8,421	26,066	23,270	2,796

* See discussion in introduction.

CALIFORNIA FRUIT AND NUT CROP ACREAGES AS OF 1951—BY VARIETIES AND AGE GROUPS—STATE SUMMARY—Continued

Acreage Planted During Years Shown and Standing in 1951

Crop and variety	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1935 to 1939	1930 to 1934	1929 or earlier	Total	Bearing acreage in 1951*	Non-bearing acreage in 1951*
POMEGRANATES																		
Wonderful	34	3			30	10	4		36			5	86	58	159	425	388	37
Other pomegranates					5										9	14	14	
All pomegranates	34	3			35	10	4		36			5	86	58	168	439	402	37
PRUNES																		
Burton				18	40	6	20	26	21	27	8	7	9	12	146	340	276	64
French	490	665	777	1,694	1,948	1,198	1,032	749	482	898	549	987	3,859	4,169	73,904	93,401	86,298	7,103
Imperial	25	30	21	65	56	30	22	58	30	131	85	91	553	723	5,817	7,737	7,493	244
Robe de Sergeant	4	18	25	87	129	22	21	21	19	30	5	12	171	132	721	1,417	1,132	285
Sugar	1	12	9	17	26		11	30	6	5		45	179	185	3,134	3,660	3,595	65
Other prunes		12	17	13	25	37	44	24	21	12	2	9	39	11	389	655	549	106
All prunes	520	737	849	1,894	2,224	1,293	1,150	908	579	1,103	649	1,151	4,810	5,232	84,111	107,210	99,343	7,867
QUINCES—all varieties								11	20	55	1	4	32	17	45	185	185	
WALNUTS																		
Concord	1	4	26	44	197	342	77	68	15	38	162	309	594	1,684	5,148	8,709	8,013	696
Eureka	162	277	193	328	572	516	302	288	288	284	253	378	1,595	2,108	9,231	16,775	14,419	2,356
Franquette	161	464	872	1,015	1,965	2,194	1,918	1,390	945	1,306	882	1,503	4,138	5,176	12,683	36,612	25,759	10,853
Hartley	347	836	539	412	556	495	295	93	108	138	60	102	141	161	143	4,426	858	3,568
Mayette	30	26	46	36	117	147	90	133	82	91	97	190	529	760	3,225	5,599	5,102	497
Payne	514	490	726	831	745	807	617	461	300	429	545	765	3,226	3,650	8,848	22,954	18,820	4,134
Placentia and similar	26	99	216	82	456	206	117	68	47	55	81	184	732	3,976	22,568	28,913	27,711	1,202
Other varieties	89	545	272	346	296	344	194	118	77	79	114	279	632	1,195	6,695	11,275	9,183	2,092
Seedlings	32	57	76	40	36	70	59	22	2	84	1	65	17	23	1,785	2,369	1,999	370
All walnuts	1,362	2,798	2,966	3,134	4,940	5,121	3,669	2,641	1,864	2,504	2,195	3,775	11,604	18,732	70,326	137,632	111,864	25,768

* See d'scussion in introduction.

NITRATE ACCUMULATION IN TOXIC QUANTITY DISCOVERED IN CALIFORNIA WEEDS

The discovery of an accumulation of potassium nitrate well in excess of the minimum toxic limit in *Amsinckia intermedia, A. douglasiana* and *Thelepodium lasiophyllum* as they grew under certain circumstances on the foothill range lands in the region of the Salinas River the spring of 1952, is of significance in relation to the livestock industry.

The "spottiness" of the sites where the storage of nitrate in the vegetation was detected is characteristic. Plants suspected of high levels of nitrate, and so confirmed by analysis, were collected from salient "islands" of luxuriant growth which, in our *limited* survey of March 25-27, were observed to be associated with limestone-bearing soils high in moisture retention and available nitrogen. It is worthy of note that the "accumulator" plants had started earlier and made a more vigorous growth than most of the other range constituents at the time soil nitrates were at their highest level before the leaching action of subsequent heavy rains.

Another factor in this protean problem of nitrate storage in certain plants, is the degree of shading or withholding of light during the early growth. Our preliminary observations in the Salinas Valley indicate the following points are of interest in this connection: north slopes, narrow valleys, low reaches of hillsides, dense fog with drifts persisting in localized draws, and successive days of abnormally high precipitation in the form of rain, hail, sleet and snow.

Possible ramifications of the accumulation of nitrates as a secondary response to 2,4-D should not be ignored. This factor has been investigated by workers in other states.—*M. K. Bellue.*

GRASSHOPPERS IN CALIFORNIA

By Robert W. Harper
Assistant State Leader, Grasshopper Control

Grasshoppers have been of recorded economic concern in California for many decades, accounts of their depredations dating back to the 1820's and earlier. With the subsequent and apparently ever-increasing encroachment on cultivated crops over vast areas of the State, damage attributed to grasshopper attack has become progressively significant. The importance of and interest in this group of insects has, therefore, increased correspondingly.

There are roughly some 200 species of grasshoppers in California, only a dozen of which are of prime economic importance. Based upon breeding habits this latter group may be classified as range land species and crop land species. Listed in order of general economic significance, our principal range land species include: *Melanoplus devastator, Camnula pellucida, Oedaleonotus enigma,* and *Hippiscus californicus,* while our major crop-land species include *Melanoplus femur-rubrum, Melanoplus marginatus, Melanoplus differentialis, Melanoplus mexicanus, Melanoplus packardi, Melanoplus bivitattus, Schistocerca vaga,* and *Schistocerca venusta. Camnula pellucida* may be rated as one of the more important members of this second category as well. A number of additional range land species such as *Esselena vanduzii, Dissosteira venusta, Dissosteira spurcata, Aulocara elliotii, Eupnigodes megacephala, Trimerotropis* spp., and others are of occasional seriousness in localized areas, while *Melanoplus rugglesi* currently infests a small portion of the Surprise Valley in Modoc County.

With the exception of *Melanoplus mexicanus,* the above grasshopper species are single brooded. Egg laying occurs for the most part from early summer through early fall months, eggs overwintering in the soil, with nymphal emergence following in the spring. *Schistocerca* spp., however, overwinter as adults. One to three or more egg pods may be deposited by each female with 15–120 eggs in each pod depending upon the species involved. Nymphal development generally entails five instars, though a small percentage of individuals of a given species may have six, while certain other species nearly always have six. Wing pads point ventrad during the first three instars, point dorsad with the fourth. On an average, grasshoppers are active over a three and one-half month period. From hatching to adulthood roughly covers a one and one-half- to two-month period, adulthood to copulation one week, copulation to ovaposition two to three weeks, and from adulthood to death another one and one-half- to two-month period.

Taxonomically the short horned grasshoppers or locusts, Family Locustidae, are divided into six sub-families; the most important being the Locustinae, or spine-breasted locusts, which includes *Melanoplus* spp., *Oedaleonotus* spp., and *Schistocerca* spp.; and the Oedipodinae, which

includes *Camnula pellucida, Hippiscus* spp., *Dissosteira* spp. and *Trimerotropis* spp. The genital area of the specimen is of prime importance in systematic classification, the cerci and furculae of the male of the species being of particular significance in some groups.

In any discussion of range land species of grasshoppers, the term migration or migratory locust is of paramount interest. The eminent authority, Uvarov, has advanced what is termed the "phase theory" of development in which grasshoppers of a given species, in a given area, are classified as solitary, intermediate, or migratory in form. It has been found that each of these phases is measurable both as to morphological and biological differences. Under optimum environmental conditions over a period of several generations, a process of change from the solitary to migrational form may occur, concurrent population build-up resulting in an overcrowded condition. Subsequent migrations, however, are the result of an inner biotic urge not correlated with the search for food nor for the acquirement of suitable breeding grounds, as favorable areas are often left in the process of these migrational tendencies. A reversion to the solitary form may occur with the advent of unfavorable conditions, and a thinning out of population intensity.

In California we have no true migratory forms at this time other than the species *Melanoplus rugglesi* in Modoc County. This species has been moving in a series of bands some 30 to 50 miles per year northwestward across Nevada for over 10 years now. Behind, it has left a light residual population reverting to the solitary form. Current egg-bed infestations occupy some 250,000 acres in northwest Nevada and southeast Oregon, overlapping the California border on its fringes in the Eagleville-Cedarville area of the Surprise Valley, Modoc County. Our other rangeland species are local in movement only, several miles to 10 or more in some instances primarily in the search for food.

The clear winged grasshopper, *Camnula pellucida,* is found in high mountain meadows, over the lusher foothills of coastal areas, and is becoming increasingly important in pasture areas of the interior valleys. Differing from other California range hoppers, this species has definite egg-laying areas to which it returns year after year. A definite correlation exists between plant species and egg-laying habitats, particular fondness being evidenced for stipa, Juncus, carex, bermuda, and other matty-rooted plants.

Other important range land species, the devastating grasshopper, *Melanoplus devastator,* the valley grasshopper, *Oedaleonotus enigma,* and *Hippiscus californicus* are of prime significance over the rolling foothills of the Sierra Nevada and coast ranges. Egg deposition is widespread, concentrations within concentrations occurring usually in well drained gravelly soil, on slopes, hummocks, or ridges, more often facing the south or west. Many pods are deposited in association with the basal growth of such plants as Russian thistle, milkweed, mustard, tarweed, etc., others are laid at the edge of or actually under shallowly resting hillside rocks, still others in the matted roots of filaree or in small, well drained bare spots. The devastating grasshopper, unlike other species, begins egg deposition only after the first fall rains, while *Hippiscus californicus* is an extremely early species, egg-laying occurring in May with adults disappearing by late June.

Of the crop species of hoppers, the lesser migratory locust, *Melanoplus mexicanus*, has characteristic habits of its own. In the midwest this species is a typical range species. In California, however, where its distribution is restricted to the Imperial, Palo Verde, and Antelope Valleys, it is typically an alfalfa inhabiting species. There are two or more generations yearly, the greatest numbers being found in May and again in September-October.

The *Schistocerca* spp. differ from other crop species in that its eggs are laid in May, the nymphs maturing by late summer, and the adults carrying through the winter. *Schistocerca vaga*, primarily a pest in grape vineyards and occasionally to citrus, is found from Fresno southwards, while *Schistocerca venusta*, notably an alfalfa pest, is restricted to the northern half of the State. Both species are localized in occurrence as compared with other crop species.

The differential grasshopper, *Melanoplus differentialis*, the marginate grasshopper, *Melanoplus marginatus*, and the red-legged grasshopper, *Melanoplus femur-rubrum*, are of economic significance primarily in the inland valleys from Kern to Shasta Counties, while the two-striped grasshopper, *Melanoplus bivitattus*, and Packard's grasshopper, *Melanoplus packardi*, are confined principally to northern mountain valleys. All are indigenous to alfalfa, clover, and pasture, breeding in and doing the greatest damage to these crops though migrating locally at times to adjacent plantings following cutting or flooding. Eggs are deposited in well-drained areas of the field, ditch banks, check levees, fence lines, etc., in the crowns of plants or in bare spots between plant growth.

The idea that hordes of hoppers suddenly appear from some distant source of infestation, or as suddenly arise in the local area, is for the most part erroneous. In theory, a grasshopper population increases in geometrical ratio in any given area. In an arbitrary factor of increase, such as six for example, is given a population of one grasshopper per 100 square feet, the population increases for this unit area over a four-year period would be as follows: 1, 6, 36, and 216 per unit area. In other words, the population for the first three years would increase from less than one per square yard to approximately three per yard. The fourth year, however, the population would jump to 20 per square yard which is considered a heavy infestation.

The above example serves to illustrate expectant population increases in a given area where no outside influences are in effect. What happens then to the hordes of hoppers which should evolve as a result of this potential fecundity, but which fail to materialize? Many environmental influences, including temperature, moisture, food supply, parasite-predator relationships, control measures, farm practices, and others, tend to reduce these populations in the making. All stages of hopper development, egg, nymph, and adult, are susceptible to these outside influences. No single factor is alone, except occasionally, of sufficient importance to check population increases, but the aggregate effect of all factors does result in noticeable population reductions.

Potential fertility or reproductional capacity is more or less stable in a given grasshopper species though the relative abundance of that particular species is not necessarily correlated with this potential, but rather with the extent to which it is exercised in the presence of the environmental factors mentioned.

Weather plays an important part in relation to the entire life cycle, effecting egg-laying, hatching, nymphal development, and adult potentials. Warm, dry weather, bringing about a rise in the activity coefficient of the hopper, leads to an increase in food consumption, and this, it has been found, leads to increased fertility. Abundant food supplies result in more egg pods and in more eggs per pod. Cold, cloudy weather, on the other hand, has the opposite effect, while a restricted diet tends towards a reduction of egg totals.

Eggs subjected to the action of low temperatures have been found to develop, upon a temperature rise above the developmental zero, more rapidly than those held at uniformly high temperatures. The low temperature apparently acts as a stimulus accelerating development after its influence has been removed. Egg development begins shortly after deposition and may proceed to an advanced stage by late fall. It is interrupted during the winter months despite temporary high temperatures, and is not resumed again until spring. In the spring, ground temperatures of 60 degrees F. or above are considered the minimum for maturation, though the amount of heat required for egg incubation may vary somewhat with the species involved. Soil temperatures are affected, of course, not only by air temperatures, but also by moisture content, soil texture, and vegetation density.

Moisture plays a definite part in the hatching process. The eggs of one Asiatic species remain viable without hatching up to three years in the absence of moisture, though recorded instances in which 100 percent embryo mortality as a result of desiccation are to be found. Hatches often occur in waves following spring rains, though excessive moisture over lengthy periods may result in mold-rot destruction of part or all of the eggs in a particular pod. The eggs of *Camnula pellucida,* however, have been known to hatch out as standing water recedes.

Total egg potentials are also governed by parasite-predator activity, the eggs themselves, nymphal forms, and adults all being subject to such attack. In California our most significant parasites belong to the Sarcophagid-Brombylid fly groups, and the ecto-parasitic Trombid mites, while our most efficient predators include blister and carabid beetles, bee and robber flies, birds, and certain animals.

Man has disturbed the balance of nature in the original flora by his farming and grazing practices and by the introduction of new plants over an ever-widening area. This has reflected itself in the grasshopper fauna, tending to promote instability among grasshopper species. Introduced plants and cultivated and grazed-over lands create an environment more susceptible to changes than is apparent in fully adapted native plants and are responsible in part for changes in the relative abundance of grasshopper species.

Grasshopper species exhibit varied changes in feeding habits as they mature. In their early stages food may be primarily dry material on the ground, with more and more green food taken as they develop. Other species may continue on dry material all of their lives; still others eat green feed entirely. After maturity is reached, some species do very little feeding, others may do considerable. Some feed on grasses only, some on selected grasses only, some on woody plants or selected woody plants only, while others feed on both grasses and shrubs. Most feeding occurs during air temperature periods of 70 degrees to 90 degrees.

It has been estimated that 15 to 20 hoppers per square yard over a 40-acre alfalfa field consume one ton of hay per day. Seven grasshoppers per square yard over rangeland may reduce grazing capacity up to 50 percent. Ten hoppers per square yard over a rangeland acre require an average of 106 pounds of feed (dry weight) from nymphal hatch to adult mortality. This is sufficient food to produce 13 pounds of beef, or 13,000 pounds of beef on 1,000 acres. At 32 cents per pound this amounts to $4,160, or $4.16 per acre.

In the early days grasshopper controls were mainly mechanical, utilizing the "hopperdozer" and similar trapping principles. Later baits entered the control picture, with one of the arsenicals as the poison ingredient. Since the introduction of the newer organic insecticides, however, control recommendations have changed considerably. Roughly these now may be listed as bait controls and spray-dust controls.

I. **Baits** are recommended over dry foothill areas; in plantings where leaf surface area is small in comparison to ground surface; or as barrier strips against migratory populations. Wheat bran has long been the basic ingredient of baits, though orange pulp has been used of late with outstanding results. Baits are classified as either wet or dry.

A. *Wet baits* have proven superior in some coastal areas where dense foliage growth has been in competition. Wet bait formulas are summarized below:

1. Sodium fluosilicate, 6 pounds; or chlordane, one-half pound; or toxaphene, one pound; or aldrin, two ounces.
2. 100 pounds of bran-sawdust (one part bran-three parts sawdust).
3. Addition of water to make a moist mixture.
4. Standard application rate of 20 pounds per acre.

B. *Dry baits* are quicker and longer killing in action under most conditions; may be made up in advance of need and stored; and lend themselves much more readily to known application techniques. Dosage ingredients are as follows:

1. Chlordane, one-half pound; or toxaphene, one pound; or aldrin, two ounces; dissolved in one-half gallon of kerosene or diesel.
2. 100 pounds of bran or orange pulp.
3. Apply at 5-10 pounds per acre rate.

II. **Sprays and dusts** are recommended over rangeland or meadows where 20 percent or more of the vegetation remains green; for crop species of hoppers in alfalfa, clover, and pasture; and as barrier applications against migratory species.

A. *Over-all spray* coverage is desirable where infestations have spread out over the acreage to be protected.

1. The per acre recommendation is aldrin, 2-3 ounces; or chlordane, $\frac{1}{2}$-1 pound; or toxaphene, 1-1$\frac{1}{2}$ pounds.
   a. Lower dosages are suggested for young hoppers in sparse vegetation; the higher dosage in denser vegetation or when longer residual action is desired, and dosages even exceeding those listed for use against adult hoppers.

b. Emulsifiable concentrates or wettable powders may be diluted with water to the extent they suit available equipment.
c. Oil solutions or emulsifiable concentrates may be mixed with kerosene or diesel fuel and applied as such, the oil mixture being more effective than the water forms, but apt to burn foliage in some cases.

2. TEPP is of value where immediate knockdown is needed or where residuals are undesirable. Twenty percent TEPP at one pint to the acre is recommended.
3. Dilan, lindane, heptachlor, parathion, compound 1189 and others are also effective grasshopper materials, but have not been as widely used as yet.
4. Dieldrin promises to be an invaluable aid in grasshopper control, its extremely retentive residual powers indicating great potentials for it in barrier work.
5. Aldrin has been used in considerable quantities over the State during 1951 with excellent results in most instances. Aldrin kills by feeding, by contact, and by fumigant action. Though it is a fairly fast acting poison, mortality increases have been more noticeable during the second 24-hour period after application than during the first. It shows residual activity approximating that of chlordane when used at equally effective insecticidal dosages.

B. *Strips or barrier sprays* may be used as timed applications in alfalfa, clover, or pasture; and as barrier strips to halt migratory hoppers.
1. Dosage recommendations are: aldrin 4-5 ounces; or chlordane 3-4 pounds; or toxaphene 4-5 pounds.
2. Chlordane 2 pounds, plus DDT 3 pounds; has given excellent results, while DDT at 5 pounds to the acre has been used successfully.

C. *Dusts* have not in general given results equaling those of sprays.
1. Over-all coverage dosages should be applied at the following rates: aldrin 3-4 ounces; chlordane $\frac{3}{4}$-$1\frac{1}{2}$ pounds; or toxaphene $1\frac{1}{2}$-$2\frac{1}{2}$ pounds.
2. For barrier or spot treatments, dosages should be stepped up correspondingly.

III. Every precaution should be taken in handling concentrates of any of the foregoing organic insecticides as they are, of course, extremely toxic to man and animals. Residual effectiveness of these chlorinated hydrocarbons to grasshoppers varies from four-five days to several weeks depending upon the material and form of its use, dosage rate, environmental conditions, and other factors. Treated foliage should not be fed to daily animals nor to stock being fattened for slaughter until all residuals dissipate. This may involve a two-three week period or even longer.

The protection of high value crops from grasshopper attack has been accepted as a control necessity, whether the infestation be indigenous to that crop or the result of migration. During 1949-1950 approximately 540,000 acres were baited, while 137,000 acres were sprayed in combating

these pests. An estimated $7,250,000 crop loss was attributed to grasshoppers during this two-year period, while savings estimated at $23,900,000 are attributed to control measures applied. The economic feasibility of combating grasshopper population over rangeland as such, however, has long been a debatable matter. More and more of late, however, recognition of grazing capacity losses are being acknowledged, and the value of such controls as a long-range program of merit is becoming evident. Facts have shown that infestation reductions of 90 percent or more in one season (25 hoppers per square yard) offer considerable assurance that grasshoppers will not be a threat for several years to come.

It is difficult, if not impossible, to consistently predict grasshopper outbreaks, on a small area basis, with a reasonable degree of accuracy. Pin-pointing of localized build-up areas is attempted, but due to area vastness, species variation, and environmental influences, no completely accurate picture is attainable. What may be expected, however, are general seasonal trend-expectations on a wider geographical basis. Surveys do, therefore, supply the preliminary information needed for the most economical and successful conduct of control campaigns.

Three surveys are essential to the accumulation of such knowledge: adult, egg, and nymphal. Each survey adds to and corrects the preceding one, so that the end result does provide a fairly reliable picture of infestation expectations. In the case of crop species infestations, however, where population variations are less likely to be brought on by environmental conditions, due to their relative consistency, the past history of the area, infestation background, acreage involved and treatments are of more significance, with considerable variation likely to occur even over a restricted area.

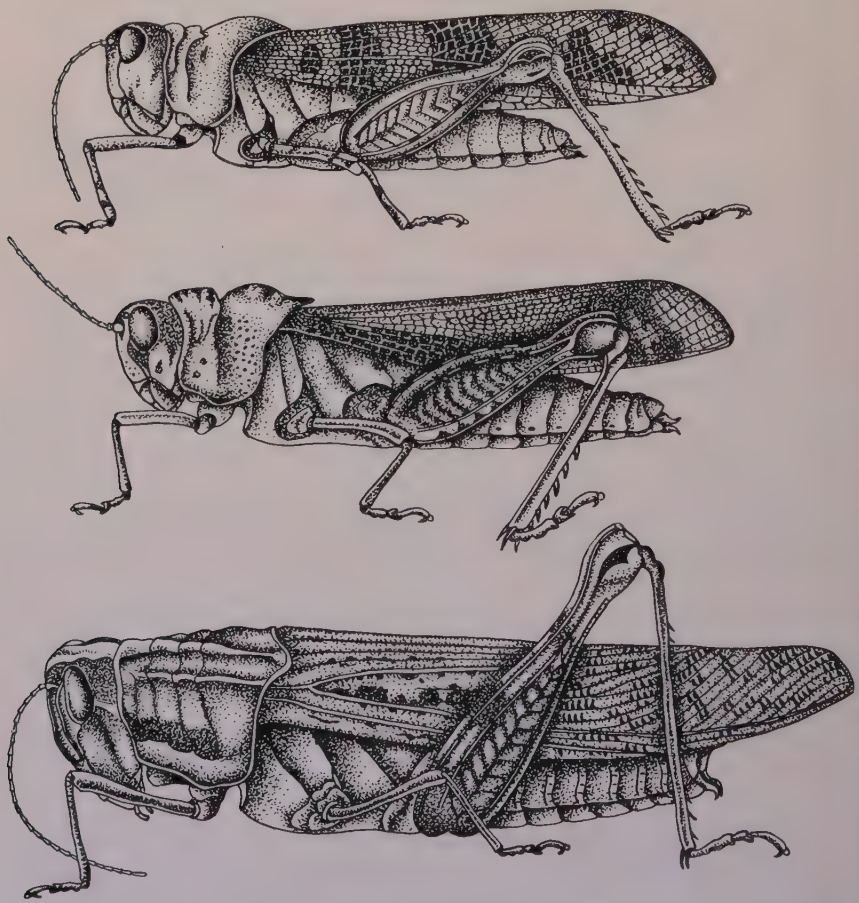
Adult surveys are generally made in August after full maturity is reached. Dispersed populations of 1-3 are considered light, 3-7 as medium, 8-12 heavy and 16 or more as serious. Owing to climatic effects, the persistence of parasite-predator activity, and other factors as mentioned, the adult survey alone cannot be depended upon as a basis for prediction. An egg survey is necessary. This survey is undertaken during the winter months after egg deposition is complete. In interpreting the results of the egg survey, the general nature of grasshopper populations must be considered. If egg-pod distribution were entirely random, random samples, if enough were taken, would reflect this distribution. In practice, however, a departure from the random condition occurs, population being bunched, this latter tendency becoming even greater in dense infestations. This is of more apparent truth in some species than in others. Thus, the weight placed upon egg-pod finds must be balanced with the specific habits of the species involved. In general less than one-half egg pod average per square foot is considered light, $\frac{1}{2}$-1 egg pod per foot as medium, 1-1$\frac{1}{2}$ as heavy and over 2 as serious.

Again influences from outside effect egg survival. Thus, the nymphal survey adds the third link in the predictionary chain. Even here, whether a given population becomes of definite economic concern or not, is dependent upon environmental developments.

In general anticipated outbreaks during the 1951 season were as expected: populations of the devastator grasshopper remained low over the inland valley foothill regions, heavy populations developing along north coastal mountains and inland valleys. Of more uniform occurrence

were pockets of trouble from the valley grasshopper, while *Hippiscus californicus* populations remained high in restricted areas. The clear-winged grasshopper was again responsible for some of our most intensive outbreaks over southern mountain valleys and coastal slopes and in Sierra Mountain meadows. *Melanoplus mexicanus* continued as a trouble-maker in the southeast though on a reduced scale, while *Melanoplus rugglesi* populations developed in moderately intense numbers only in the northeast. Crop species of hoppers continued to give trouble throughout the inland valleys.

Adult surveys to date, indicate that our major dry-range species, *Melanoplus devastator,* is once again on the increase in the northern half of the State, and that greater numbers of this species over a wider area may be anticipated in 1952. Lush range conditions, however, may minimize their economic significance. In the south the effects of drought conditions over the past five years apparently continue to hold this species in check. Declines in crop species infestations should become more apparent during 1952 due to the accumulative effect of ever increasing acreage treatments over the past three or four years.



Three common types of California grasshoppers. Top, *Trimerotropis* sp.; center, *Dissosteira* sp.; bottom, *Schistocerca* sp.

DR. ARTHUR G. BOYD

Effective March 19th, Dr. Arthur G. Boyd, for many years Assistant Chief of the Division of Animal Industry, was appointed chief, succeeding Dr. A. K. Carr, who retired to private life. Dr. Boyd has created for himself a prominent place in his profession and has played a major roll in campaigns against animal diseases in California. Included in the programs are two outbreaks of foot-and-mouth disease, control of bovine tuberculosis, eradication of sheep scabies, and the program to control brucellosis. Dr. Boyd was a leading official in the organization of the California meat inspection service which has won nation-wide praise and has been the model for similar services in other states.

Dr. Boyd was born in Chicago in 1898; he attended technical schools and the University of Chicago, graduating in 1918 from McKillip Veterinary College with the degree of Doctor of Veterinary Medicine. He was commissioned a lieutenant shortly after the outbreak of World War I, and served in France and England. Upon completing his military service, he was connected with the Michigan State Veterinarian's office and the Michigan State Department of Public Health. Following this he was employed by the U. S. Bureau of Animal Industry in virus-serum control, and in meat inspection work in Omaha, Nebraska, and Fort Dodge, Iowa.

In April, 1922, Dr. Boyd accepted a position as field veterinarian in the Division of Animal Industry in California's newly organized Department of Agriculture. In 1929, following civil service examination, he became assistant chief of the division, which position he held continuously until his appointment as chief of the division.

DR. JAMES E. STUART

Dr. James E. Stuart has been appointed Chief of the Bureau of Livestock Disease Control of the Department of Agriculture, the position held by Dr. A. G. Boyd prior to his appointment as Chief, Division of Animal Industry.

Born in Anaconda, Colorado, Dr. Stuart graduated from Alamosa High School in 1916, and in 1922 was awarded the degree of Doctor of Veterinary Medicine by Colorado State College.

Dr. Stuart has been an employee of the department since 1924, except for two years of military service in World War II. He entered the Army as a private in 1942, and was discharged with the rank of captain in the Veterinary Corps.

He was appointed a field veterinarian with the Division of Animal Industry, California Department of Agriculture, in April, 1924, at the time of the first major outbreak of foot-and-mouth disease. He continued in that capacity until 1929, when he was assigned to the Los Angeles office of the division. In 1935 Dr. Stuart was named veterinarian in charge of that office. In 1937 he was promoted to supervising veterinarian. In 1940 he supervised the bovine tuberculosis program from the Sacramento office.

On his return from military service in 1944, Dr. Stuart was placed in charge of the pullorum disease control program of the Division of Animal

Industry, and in January, 1948, he was named district veterinarian in charge of the Modesto office, the position he held until his appointment to the office of Chief of the Bureau of Livestock Disease Control on April 18th.

DR. A. K. CARR

After 23 years of outstanding public service with the Department of Agriculture, Dr. A. K. Carr, Chief of the Division of Animal Industry, retired on March 17th. He returned to Southern California which has been his home for many years and where his interests are located.

Dr. Carr is considered one of the Nation's authorities in the field of veterinary medicine and attained unusual success in administration of various disease control programs made effective during his long state service.

PAUL G. ROBERTSON

On March 14th the Director announced the appointment of Paul G. Robertson as Assistant Chief, Bureau of Livestock Identification, Division of Animal Industry. He was appointed from a civil service list of eligibles. Mr. Robertson entered the service of the department in 1933 and continued in the enforcement work until 1942 when he accepted an administrative position with the U. S. Department of the Interior. In 1946 he returned to the department as Supervising Enforcement Officer, Bureau of Markets, where he served until his appointment March 14th.

Mr. Robertson is a graduate of Yale, and subsequently studied law at Southwestern University.

PRESENT STATUS OF THE OLIVE POLLINIA SCALE, *POLLINIA POLLINI* (COSTA), IN CALIFORNIA

(Homoptera; Coccoidea; Asterolecaniidae)

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INTRODUCTION

The year 1944 was marked by some rather interesting and important discoveries of insect pests likely to cause concern to certain California agricultural crops. These findings were the result of activities of federal entomologists who were conducting a general insect pest survey around California maritime ports of entry under the direction of Dr. Herbert T. Osborn, Survey Entomologist, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, made in cooperation with state and county regulating officials. One of the scale insects found during the course of this survey was the olive pollinia scale, *Pollinia pollini* (Costa), infesting olive at Jamul in San Diego County, on April 7, 1944, by two crew members, S. V. Weimer and George Prole. On July 14, 1944, this same species was taken at Asti in Sonoma County by B. H. Byers, another crew member, working independently and before the first find had been identified. The preliminary identification was made by the junior author and later confirmed by Harold Morrison, Coccidologist, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture. Subsequent state surveys, 1945-1946, revealed its further occurrence in San Diego and Sonoma Counties, as reported in detail under the "Recent History" section of this article. Earlier records (1894) show this scale as having been found infesting young olive trees at Pasadena, Los Angeles County, which had been received six years previously from Italy. Immediately following discovery, the infested trees were reported to have been destroyed. At the time these trees were brought into California, quarantine regulations unfortunately had not yet been formulated.

HISTORICAL

In 1894, Alexander Craw, then California State Deputy Commissioner of Horticulture, reported the following about this scale insect: "Mr. John Scott, County Commissioner of Los Angeles, made a most opportune find in his county last February. This was a new and very serious scale pest, *Pollinia costae*,* of the olive. It is a small light-colored scale that clusters in thick patches over the large branches and twigs of the olive. From the appearance of the specimens sent me I consider this the most serious pest

* Later proven to be a synonym of *Pollinia pollini* (Costa).

that could possibly be disseminated through the olive orchards of the State. The trees upon which it was found were purchased in Italy six years ago, and in that time were so seriously affected that but few leaves remained and the trees made little or no new growth. The twigs were covered with fungus, under which the scales congregated. The trees were cut down and the branches burned. A close watch will be kept to see that it has not spread. A careful examination should be made of all olive trees that have been introduced from Europe, to see that they are not infested with this scale. The spread of this pest at a time when we have a good prospect of having perfectly clean olive trees in the near future by the good work of the *Rhizobius ventralis*, would be an event to be deplored."

In 1896, Alexander Craw further reports on this scale insect as follows: "In 1887 a few olive trees were received at Pasadena, Los Angeles County, direct from Italy. In 1893 the trees were found to be very seriously infested with this small but destructive scale. The trees were stunted, with scant foliage, having made very little growth the two years previous. The trees were destroyed and a thorough inspection of all olive trees in that district was made, but no more could be found. The scale has no particular form, but cluster over each other in dirty white masses."

In 1903, Mrs. Maria E. Fernald in her Catalogue of the Coccidae of the World reports the scale on olive, its habitat being given as Italy and California. She further indicates that *Pollinia costae* Targioni is a synonym of *P. pollini* (Costa).

In 1907, Edward K. Carnes published an article entitled "The Coccidae of California," in which he included the following note about this scale insect: "This scale was introduced in 1887 from Italy on a shipment of olive trees, but its presence was not noticed until 1893, when the trees were destroyed and a careful search made for any other infestation. None has been noticed since that time, although a careful inspection has been made many times since, and it is reasonable to suppose that it was eradicated."

In 1912, C. F. Baker and E. O. Essig in a Host Index of California Coccidae included the following: "on *Olea fragrans* (olive), *Pollinia pollini*. Appeared in Los Angeles County, but was eradicated—Carnes." Correspondence with Professor Essig (January 16, 1945) includes the following, with reference to this scale insect: "You will note that the statement is made that it appeared in Los Angeles County but was eradicated. This was on the word of E. K. Carnes. Of course it may not have been eradicated. The host was olive. I do not have any material in my collection which indicates that I never had it in my possession."

RECENT HISTORY

Apparently the scale was not again found until 1944 when, as previously stated, it was collected at Jamul, about 16 miles east of San Diego in San Diego County, and at Asti in Sonoma County. In both instances it was found independently, on olive, by field inspectors conducting federal surveys for introduced pests in the vicinity of maritime ports.

Subsequent surveys by federal, state and county personnel to delimit the infested areas in San Diego and Sonoma Counties were made during 1945-1946 and again to a limited degree in Sonoma County in 1952. In

1945 infestation in the vicinity of Asti was recorded as extending approximately four miles to the north and west reaching the south city limits of Cloverdale, and an equal distance south to the north city limits of Geyserville. In 1946 an infestation in the cemetery one-half mile east of Cloverdale was found which slightly extended the known infested area. At Jamul the infestation seems restricted to a radius of two miles to the north and west. In 1952 no further spread was found at Jamul. In Sonoma County, however, the infested area was extended roughly one mile north and one-fourth mile south of the previously known limits. Scouting during 1945 by Osborn and other members of the federal survey did not disclose infestation in the previously reported Pasadena area, nor did spot surveys of olive in other widely separated areas during this survey disclose additional infestations. In the intervening six years, spot surveys throughout the State were made without finding any infestation outside the limits of the two areas as reported. These surveys were carried out by state and county personnel.

At Jamul during 1945-1946, the olive pollinia scale was collected within a radius of 1¼ miles to the north and west of that small community. The Jamul collections were made almost entirely on trees in old abandoned orchards, their value being mainly shade for livestock. In Sonoma County they were restricted to roadside and yard trees, there being only two or three semiabandoned olive orchards in the area.

These findings in San Diego and Sonoma Counties would seem to indicate an exceptionally low rate of natural spread from the originally infested areas, primarily due to their geographical isolation from commercial areas.

EXTERNAL FEATURES OF OLIVE POLLINIA SCALE

Examination of the mature adult female scale (see inset Figure 1) show it to be enclosed within a rather hard, white, waxy covering or test, formed of secretions from tiny wax ducts inherent to the scale. The amber colored body of the adult female, when removed from the waxy test, measures approximately 1.50 mm. in diameter, and is normally pyriform in outline, particularly when the scale has matured on smooth bark surface. However, the habit of the crawlers (nymphs) in settling and later maturing in small bark crevices contributes considerably to much body-shape irregularity—no two scales appearing in exactly the same form. (See inset on Figure 1.) The covering of male scale is smaller than that of the adult female, although it is more elongate, and of a uniform light yellow-cream color.

BIOLOGICAL NOTES

There is no recorded literature on the life history of the olive pollinia scale in California. In Italy, however, Leonardi (1920) indicates that this scale presents two generations annually—the first occurring during May and June and the second during September and October. It would seem logical to presume that such might also be the case particularly in interior California if the scale were ever to become established there. The Mediterranean region rainfall pattern is characterized by winter-spring rains and hot dry summers, similar to interior California conditions.

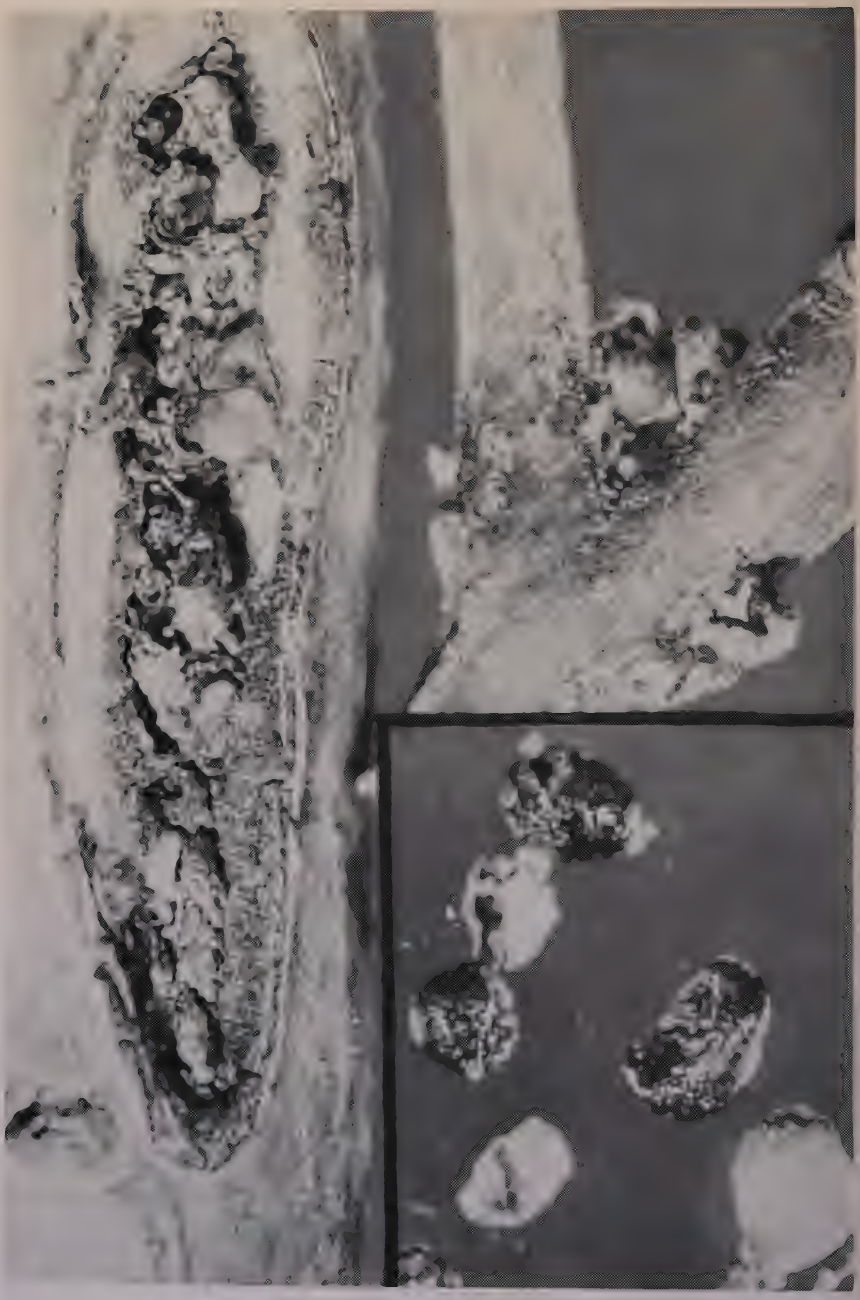

FIGURE 1. Enlargement of a crevice on olive twig infested with the olive pollinia scale, *Pollinia pollini* (Costa). Necrotic areas are commonly found under such crevices which are infested with masses of feeding scale. The scale will also frequent twig axils as is here shown.

Inset includes dark adult female scales and their lighter colored coverings or tests. The irregularity of body shape is peculiar due to the scale crowding against one another as they mature in the confined area of the bark crevice. The photographs are greatly enlarged. (*Photographs by Clifford Clower of this department.*)

The infested area in Sonoma County is restricted to a narrow valley by natural barriers. This locality is approaching the most northerly limit in which olive is planted along the coast—a few trees being found at Ukiah. A single large olive tree in Humboldt County inspected during the survey showed no infestation. Also south of Geyserville there are considerable gaps between plantings of olives, and, as far as can be determined, there has been no occasion to take propogative material or finished trees out of the area. It is believed that such factors as these tend to delimit the spread of the scale. Consequently, no urgent need has been recognized for quarantine or eradication procedures.

It now developes that a second scale species * has been found (April 3, 1952) infesting olive in this same area, and surveys are now under way to delimit the infestation. The discovery of a second scale species in the area again brings up the desirability of reviewing the economic aspects regarding these scales, and the necessity for quarantine and eradicative measures. While it is difficult to determine the extent to which the olive trees have been injured, the possibility must be considered that if introduced into commercial olive producing areas such as the Sacramento and San Joaquin Valleys, conditions might favor build up of these scales to a point at which they might become serious pests.

These same considerations should apply to the localized and isolated infestation occurring in the vicinity of Jamul in San Diego County.

HOSTS ATTACKED

A search of the literature indicates that olive is the only known host of the olive pollinia scale. This has been substantiated by collections made in California by federal and state survey crews who examined many different kinds of plant species in the areas inhabited by the scale insect.

NATURE OF INJURY

While Craw reported injury—recent investigation has failed to confirm his finding, possibly due to fringe areas. The scale settles in considerable numbers in small bark crevices (Figure 2) mainly on twigs and small branches, and in the twig axils of olive. In the case of heavy infestations, stem and twig axil lesions and necrosis are produced beneath the feeding scale. It is reported in literature that heavily infested trees lose considerable foliage and become noticeably stunted. This serious damage has not been apparent to California entomologists due possibly to the condition under which the infested trees are growing. The scale has never been recorded infesting the fruit nor has it been observed on fruit in the California infestations. This would tend to minimize its economic importance.

WORLD DISTRIBUTION

The olive pollinia scale, *Pollinia pollini* (Costa), is found in the following European countries: Cyprus, Dalmacia, France, Italy and the Sporades (Dodecanese) Islands. In the United States the scale was apparently introduced on young olive trees brought into California in the late eighties or early nineties.

* *Lepidosaphes Destefanii* Leonardi (Homoptera ; Coccoidea ; Diaspididae).

FIGURE 2. Infestation of the olive pollinia scale, *Pollinia pollini* (Costa) on olive twigs collected at Cloverdale, Sonoma County, California. Note particularly the manner in which the scales congest in dark crevices on twigs. Photograph is actual size of twigs. (*Photograph by Clifford Clower of this department.*)

PRESENT DISTRIBUTION IN CALIFORNIA

The olive pollinia scale, *Pollinia pollini* (Costa), is apparently confined in its distribution in California to the very restricted areas in San Diego and Sonoma Counties in which it has been recorded. In San Diego County the infestation centers around Jamul—the area inhabited including not more than a two-mile square. In Sonoma County the infestation is limited to a narrow valley, extending from just north of Cloverdale south to Geyserville, a distance of approximately 10 miles where its host is restricted to roadside and yard trees. Only two or three semiabandoned orchards are found in the area. Apparently the infestation originated at Asti, where olive trees were brought from the Mediterranean area, more than 60 years ago, by the Italian Swiss Colony. The trees were planted mainly along rows leading into the Italian Swiss Colony properties.

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CURRENT INSECT NOTES

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Continuing the series of current insect notes, the following items have been selected from reports of departmental field workers and county agricultural commissioners' offices associated with specimens submitted to and processed by the identification laboratory of the Bureau of Entomology.

An Eriophyid mite, *Aceria* sp., new to California and not as yet specifically identified, was found infesting carnations at Goleta, in Santa Barbara County, by R. James Reid, of the county agricultural commissioner's office. According to H. H. Keifer, the species closely resembles but is different from one infesting carnations in Europe. Subsequent survey has shown this mite, which has previously gone undetected, to be fairly widely distributed in Southern California. In addition to the original finding in Santa Barbara County, infestation was found in commercial plantings of carnations at San Fernando, Sierra Madre, San Gabriel, and Van Nuys in Los Angeles County, and at Costa Mesa in Orange County. A quick survey of commercial plantings in the San Francisco Bay region failed to disclose its presence there. However, a similar type of injury credited to its attack in Southern California, consisting of a water-soaked appearance of the foliage, dwarfing of basal growth, and multiple sprouting, was found under certain conditions in the Bay region plantings, suggesting that the mite itself was possibly not the only cause. In no instance was the mite found damaging flowers or flower buds, though occasional specimens were found on stems at the base of the flowers. It is possible that infestations in the past have been overlooked or held below damaging numbers as a result of treatments applied for other mites. As a result of these observations and lack of any positive evidence of economic importance, together with its rather widespread distribution in Southern California, it is being accepted as an established species and control measures considered a matter of local concern depending on the conditions involved.

The Egyptian alfalfa weevil, *Hypera brunneipennis*, is appearing in considerable numbers at various points in San Diego County associated with both sweet clover and burr clover. Specimens have been submitted to Sacramento for identification, collected by San Diego County Inspector R. J. Buckner, most recently from Point Loma. Previously it had been taken at Escondido, Vista, Chula Vista, Lemon Grove, and La Mesa, indicating rather widespread distribution. Recently information from Imperial County suggests that this species is also showing some importance as a pest of alfalfa. When it first made its appearance several years ago in the Yuma area it was evaluated as being of no serious economic importance and its attack restricted to wild clovers. In view of the present

increase in numbers and in its distribution it would appear to merit careful watching.

The fig scale, *Lepidosaphes ficus*, has been reported for the first time from south of the Tehachapi Mountains. Specimens taken by County Agricultural Inspector David H. Byers were received on March 12, 1952, taken from fig growing at Fullerton, in Orange County.

A root boring mite, *Epilomannia cylindrica* (Berl.) was submitted from the roots of ash trees at Atwater, Merced County. The specimens were submitted on January 28, 1952, by County Agricultural Commissioner E. A. Danison. Infested roots showed peculiar surface injury. According to H. H. Keifer, their examination disclosed rather extensive burrows under the surface which were filled with characteristic elliptical frass pellets. In support of the finding that the mites were responsible for the burrowing was the finding of frass pellets within their bodies. Identification is based on information furnished by the Office of Insect Identification of the U. S. Bureau of Entomology and Plant Quarantine, Washington, D. C., to which the specimens were submitted. This mite apparently is widely distributed both in Europe and North America and has often been found burrowing in grape roots suspected of harboring phylloxera. Its precise economic status is unknown.

The broad-nosed grain weevil, *Caulophilus* sp. near *latinasus*, has previously been reported in California in association with avocado seeds held in storage in the southern part of the State. Apparently it has never become of much economic importance, although it has been known along the southern coast for many years. Recently specimens were submitted by State Survey Entomologist Ronald Hawthorne from the seed of a tree known as "slugwood", *Beilschmedia meirsi*, growing at Santa Paula, in Ventura County. Collections were made on February 28, 1952.

The oystershell scale, *Lepidosaphes ulmi*, is of more or less general distribution in California on a wide range of hosts including in particular willow, poplar, and ceanothus. On February 27, 1952, State Survey Entomologist R. P. Allen submitted specimens taken from toyon, *Photinia arbutifolia*, collected at two locations in Berkeley, Alameda County. One of these was just north of California Hall on the university campus.

Olive parlatoria scale, *Parlatoria oleae*, continues to extend its range in California. On April 26, 1951, specimens were submitted by Deputy County Agricultural Commissioner Roy Gamblin from Cucamonga, San Bernardino County. The infestation was found in a commercial peach orchard under conditions indicating it may have been of long standing. This is the first record of this scale having been found in that county. More recently several properties have been found infested at Tracy, in San Joaquin County, involving various varieties of deciduous fruits. On March 12, 1952, County Agricultural Inspector R. W. Nelson submitted specimens from toyon planted in a parkway in front of a commercial nursery at Marysville, in Yuba County. Inasmuch as the infested plants had been brought in from the foothills, its finding was first assumed to indicate a possible established infestation on this host in the wild. However, it was subsequently found that the plants had become infested from nearby privet hedge on which infestation had previously been undetected. This infestation represents the second infestation found in that county in the same general immediate area.

Receipt of specimens submitted by State Survey Entomologist Ronald Hawthorne and L. E. Myers, Entomologist in Los Angeles County, from San Marino, Los Angeles County, indicating that an earlier infestation of the Chinese obscure scale, *Parlatoreopsis chinensis,* still persists on ornamentals in the only known infestation in California. Originally given eradication attention, such action was discontinued following the reported observation of the Federal Bureau of Entomology and Plant Quarantine that it had failed to show any serious economic importance in Missouri where it had also been under eradication.

Larvae of the avocado leaf roller, *Amorbia essigana,* were submitted by County Agricultural Inspector H. T. Oldham on January 15, 1952, which had been found infesting orange in Carlsbad, San Diego County. This species was originally described by Busck from avocado and had not previously been reported as attacking orange.

Larvae of the lima bean pod borer, *Etiella zinckenella,* were found infesting the roots of locoweed, *Astragalus lentiginosus,* in the vicinity of Maricopa. Submission was made by H. L. Wilson, entomologist associated with beet leafhopper control. This weed is apparently one of the native hosts responsible for the persistence of this moth in California. The collection was made December 28, 1951.

For a number of years specimens of a small, light tan moth infesting houses in the San Francisco Bay region, have been submitted to Sacramento for identification with the thought that they might be clothes moths. Identification by H. H. Keifer, however, showed them to be the imported house moth, *Borkhausenia* near *minutella.* Keifer reports that while the exact life history of this moth is not known, its relationships indicate it as a scavenger with the larvae possibly feeding on moldy trash under or near houses. The most recent submission of this species was by Sonoma County Agricultural Commissioner P. F. Wright, representing specimens taken at Santa Rosa on January 8, 1952.

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